

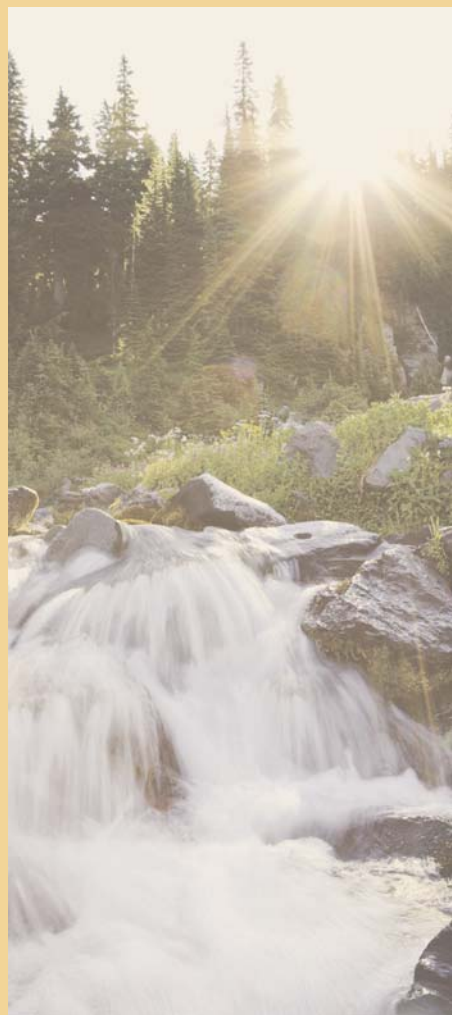
***EPA's 2007 Report on the Environment:
Highlights of National Trends***

Peer Review and Public Comment Draft

August 2007

EPA's 2007 Report on the Environment: HIGHLIGHTS OF NATIONAL TRENDS

The U.S. Environmental Protection Agency (EPA) developed EPA's 2007 Report on the Environment to help answer questions that are of critical importance to the Agency's mission to protect human health and the environment. The Report on the Environment documents trends in the condition of the nation's environment and human health and identifies significant gaps in our knowledge. It is not intended to be a report card on EPA's programs and activities.

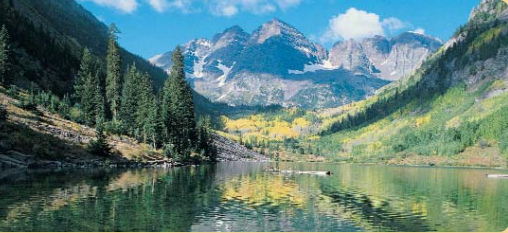


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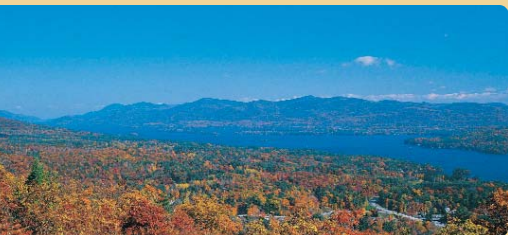
ABOUT THIS DOCUMENT

Written for a general audience, this document, *EPA's 2007 Report on the Environment: Highlights of National Trends*, summarizes some of the more important findings from a more comprehensive companion report, *EPA's 2007 Report on the Environment: Science Report*. A Web-based tool, the *Electronic Report on the Environment (e-ROE)*, facilitates navigation and searching across both documents.



Highlights of National Trends is organized around 25 topics that are important to EPA. Each topic page includes a brief summary of what we know—and don't know—about conditions and trends in the nation's air, water, land, ecological condition, and human health. The information on these topics comes from highly reliable indicators (see box) and is based on the most recent data available from a variety of governmental and non-governmental organizations.

Highlights of National Trends features a subset of indicators from the more comprehensive *Science Report*. The indicators shown here were selected for inclusion based on their importance to the public and scientists, as well as their ability to answer a series of key questions about the environment. These key questions and 86 associated indicators form the framework of the *Science Report* and are listed at the end of *Highlights of National Trends*. In addition, only a few of the most important data gaps and limitations from the *Science Report* are included in this report. The reader is encouraged to consult the *Science Report* and *e-ROE* for more information.



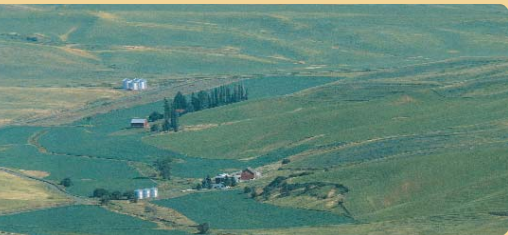
ENVIRONMENTAL INDICATORS

The indicators used in the Report on the Environment:

- Rely on actual measurements of environmental and human health conditions over time.
- Meet a set of standards, which include quality, accuracy, relevance, and comparability.
- Were reviewed by an independent scientific panel to ensure that they meet these standards.
- Are national (or in some cases regional) in coverage. They do not describe trends or conditions of a specific locale.
- Come from many governmental and non-governmental organizations, which collect data at different time periods and for varying purposes.
- Can only partially answer the key questions.

This information is distributed solely for the purpose of pre-dissemination peer review under applicable information quality guidelines. It has not been formally disseminated by EPA. It does not represent and should not be construed to represent any Agency determination or policy. Please submit comments at www.regulations.gov.

ABOUT THE DATA IN THE REPORT ON THE ENVIRONMENT



The indicators in the Report on the Environment are comprised of actual measurements of the environment over time and do not describe activities to protect the environment. All of the indicators were reviewed by an independent panel and meet strict definitions and criteria, including scientific quality and national (or in some cases regional) coverage. Other sources of information are not included in this report because they do not meet one or more of the criteria.

Data limitations are noted to provide the reader with information about the quality or extent of the data presented that may affect the way in which they are used. Generally, such limitations cause greater uncertainty in drawing conclusions about actual conditions in the environment. Data gaps are noted to identify areas or aspects of the environment in which little or no measurement is done. This report does not propose actions to reduce data limitations or fill gaps.

As such, each topic page in *Highlights of National Trends* acknowledges some of the most important limitations of the indicators presented, or where gaps exist. For example, we do not have long-term trends about the condition of the nation's waterways because of inconsistent measurements over time.

EPA's 2007 REPORT ON THE ENVIRONMENT

Highlights of National Trends is one of three products that collectively make up EPA's 2007 Report on the Environment. The other two products are:

- **EPA's 2007 Report on the Environment: Science Report** is the source of the information presented in *Highlights of National Trends*. The *Science Report* is organized around key questions about the environment and presents 86 indicators to help answer those questions.
- The **electronic Report on the Environment (e-ROE)** is a Web-based tool for navigating and searching EPA's 2007 Report on the Environment: *Science Report* and EPA's 2007 Report on the Environment: *Highlights of National Trends* (insert URL to be provided when available).

UPDATES TO THE REPORT ON THE ENVIRONMENT

EPA's 2007 Report on the Environment brings together the most consistent and reliable information on national environmental conditions and trends currently available under a single cover. It builds on EPA's *Draft Report on the Environment 2003*, which was the Agency's first effort to assemble scientifically sound indicators on the status and trends of the nation's environment.

Since the release of the 2003 report, EPA has revised, updated, and refined the information in the Report on the Environment in response to scientific developments as well as stakeholder feedback. EPA will publish periodic updates of the Report on the Environment and use it to inform the Agency's strategic planning process.

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AIR



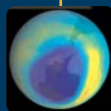
Outdoor Air



Acid Rain and Regional Haze



Ozone Depletion



Greenhouse Gases



Indoor Air



Close to the Earth's surface, air provides the oxygen and carbon dioxide needed to sustain human, animal, and plant life. Higher up, a natural layer of ozone shields life on Earth from the sun's harmful rays, and at all levels of the atmosphere, naturally occurring greenhouse gases help maintain a climate suitable for life. Indoors and outdoors, from ground level to high above the planet's surface, the condition of the air is critical to human health and the environment.

Tracking the nation's air quality is challenging because of the many sources, types, and effects of air pollution. Most outdoor air pollution can be directly traced back to emissions sources that release pollutants into the air. Others, such as ozone, are formed when an emission reacts with other substances in the air to form a pollutant.

Once airborne, pollutants can be transported long distances by wind or transformed into other compounds. They also can fall back to Earth, contaminating water and land. Both the amount of pollutants emitted into the air and how these pollutants move through the atmosphere determine air pollution levels, which are measured as concentrations.

Many indicators are needed to characterize outdoor air quality separate from indoor air quality, to characterize air quality trends at ground level as well as higher in the atmosphere, and to characterize both emissions and concentrations. Also, air quality varies considerably with location and time, which makes it challenging to obtain a representative national picture.

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OUTDOOR AIR

Outdoor air pollutants come from human activities such as electricity production, industrial processes, and transportation, and from natural sources like wildfires and wind-blown dust. Some of these pollutants can harm human health, the environment, and other valued resources.

Beginning in the 1970s, EPA developed standards to protect human health and the environment from six common air pollutants that pose serious health and environmental effects: carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide. These pollutants are often referred to as “criteria pollutants.”

KEY POINTS

Nationwide, emissions of criteria pollutants (or the pollutants that form them) due to human activities have decreased. Between 1990 and 2002, emissions of carbon monoxide, volatile organic compounds (which lead to the formation of ozone), particulate matter, sulfur dioxide, and nitrogen oxides (which lead to the formation of ozone and particulate matter) decreased by differing amounts, ranging from 18 to 34 percent. For lead, emissions have decreased by 99 percent, but this reduction is based on data that span a longer time frame (1970 to 2002).

Outdoor air concentrations of carbon monoxide, lead, nitrogen dioxide, ozone, and particulate matter have decreased over the decades during which the current nationwide monitoring network has operated. These reductions are consistent with the observed decreases in emissions mentioned above. In most or all of the United States, concentrations of carbon monoxide, lead, and nitrogen dioxide have decreased such that levels now meet EPA’s standards to protect health and the environment. Though concentrations of ozone (see graphic) and particulate matter have decreased nationwide, concentrations still exceed EPA’s standards for either or both pollutants in dozens of metropolitan areas.

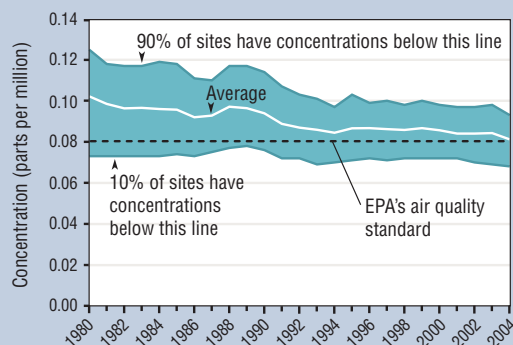
For selected air toxics, emissions due to human activities and concentrations have decreased. Nationwide, emissions summed across all 188 air toxics decreased between 1990 and 2002. This includes a 54-percent reduction in mercury emissions. Monitoring networks are extensive enough to determine corresponding national trends in outdoor air concentrations of benzene, which decreased 61 percent between 1994 and 2004.

Subsequently, EPA identified an additional 188 pollutants of concern, called air toxics, which are known or suspected to cause cancer, other serious health problems, and adverse environmental effects. Examples include benzene, which is found in gasoline; metals such as mercury and cadmium; dioxin; and asbestos.

There are several ways to measure outdoor air pollution trends. Emissions can be measured or estimated at their source, and concentrations of pollutants in air can be monitored at numerous outdoor locations around the country.

National indicators are not available for other aspects of outdoor air quality. While indicators provide insights on emissions and concentration trends for many pollutants, monitoring networks are not yet extensive enough to determine national trends in concentrations for all pollutants, including many air toxics. Further, the indicators are limited in quantifying how outdoor air quality affects human health and the environment. Although strong evidence links outdoor air pollution to health effects at specific locations, few long-term studies at a national scale have measured the extent to which health effects are linked directly to outdoor air quality.

Ozone Concentrations in Outdoor Air, 1980-2004



Concentrations are expressed in terms of EPA’s air quality standard.

Source: U.S. Environmental Protection Agency, Air Quality System Database, 2005

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ACID RAIN AND REGIONAL HAZE

Each year in the United States, millions of tons of sulfur dioxide and nitrogen oxides are released into the air from the burning of fossil fuels. These pollutants react with other airborne substances to form acidic compounds (sulfates and nitrates). Acid deposition occurs when these compounds fall to the Earth in one of two forms: wet (dissolved in rain, snow, and fog) or dry (as gases or particles). Wet deposition is more commonly referred to as “acid rain.”

Acid deposition is of concern because it can make soils, lakes, and streams more acidic, which can harm fish, amphibians, water birds, and other species in affected areas. It can also damage trees, buildings, monuments,

painted surfaces, and other materials. Acid rain can be tracked in several ways: by evaluating emissions of sulfur dioxide and nitrogen oxides (the pollutants that form sulfates and nitrates), by monitoring acid rain directly, and by measuring the acidity of water bodies.

The pollutants that form acid rain also form airborne particulate matter, which contributes to regional haze. Regional haze, tracked by visibility measurements, is caused when sunlight encounters tiny airborne particles that limit the distance one can see. Regional haze also degrades the color, clarity, and contrast of vistas, including those found in many National Parks and Wilderness Areas. Certain substances impair visibility more during humid conditions.

KEY POINTS

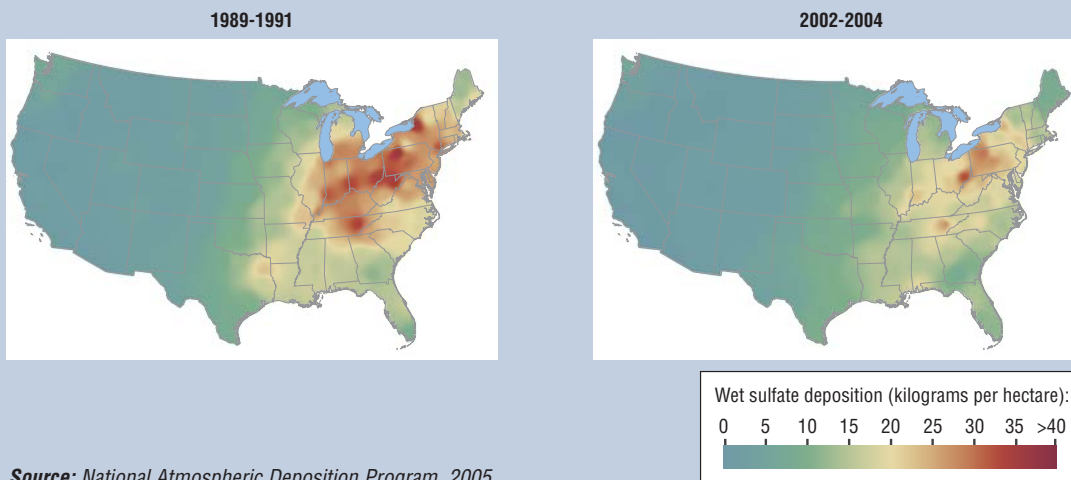
Nationwide, emissions of the main pollutants that form acid rain decreased between 1990 and 2002. Emissions of sulfur dioxide due to human activities decreased by 34 percent, and emissions of nitrogen oxides due to human activities declined by 18 percent.

Acid rain, as measured by wet deposition of sulfates and nitrates, decreased across most of the country from 1989 to 2004. Consistent with emissions data, average regional decreases in wet deposition of sulfate during this time were 36 percent in the Northeast, 32 percent in the Midwest, 24 percent in the mid-Atlantic, and 19 percent in the Southeast (see graphic). Wet deposition of nitrate also decreased in some parts of the country, but to a lesser extent than wet deposition of sulfate.

Many surface waters in the upper Midwest, Adirondack Mountains, and northern Appalachian regions have become less acidic since 1990. This change corresponds to a decrease in acid rain in these regions. While acidic surface waters are still found in these areas, some surface waters are showing signs of recovery. National indicators are not available to track trends in other ways that acid rain has harmed the environment or human health.

Regional haze in National Parks and Wilderness Areas remained relatively unchanged between 1992 and 2001. On average, the West has substantially better visibility than the East due to regional differences in air pollution and the greater humidity in the East. National indicators are not available to track regional haze in cities or other populated areas.

Wet Sulfate Deposition, 1989-1991 Versus 2002-2004



Source: National Atmospheric Deposition Program, 2005

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OZONE DEPLETION

Ozone is a gas present throughout the Earth's atmosphere. Most of this ozone is concentrated in a layer in the stratosphere—a portion of the atmosphere many miles above the planet's surface.

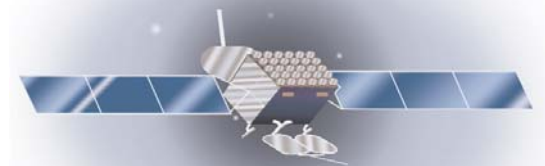
The ozone layer protects people, animals, plants, and other living things by absorbing most of the sun's harmful ultraviolet radiation, which can lead to more cases of certain types of skin cancer and cataracts and can harm crops and ecosystems. In contrast, ozone in the troposphere (the portion of the atmosphere from ground-level to the stratosphere) is a pollutant that poses a health risk.

Certain ozone-depleting substances, which are man-made and emitted at ground level by sources worldwide, have been damaging the ozone layer for many years. Once these chemicals rise from the troposphere into the stratosphere, they directly lead to ozone depletion: a thinning of the ozone layer over some areas of the world.

Ozone-depleting substances include chlorofluorocarbons (CFCs), which were once extensively used as propellants

in spray cans and as refrigerants and solvents. Many countries, including the United States, are phasing out the production and use of CFCs and other ozone-depleting substances. Because many of these substances persist in air for a very long time, the ozone layer will take years to recover, even after these chemicals are no longer released.

Ground-based measurement networks and instruments on board aircraft, balloons, and satellites are used to monitor both the thickness of the ozone layer and concentrations of ozone-depleting substances in the troposphere and in the stratosphere.

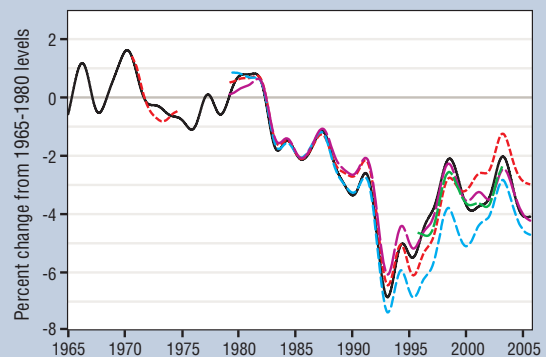


KEY POINTS

Stratospheric ozone over North America has decreased since 1979. Before the late 1970s, there was little change, beyond natural variations, in the thickness of the ozone layer over North America. Since then, the thickness of the ozone layer has decreased, reaching its lowest level in 1993 (see graphic), with no further decline occurring in more recent years. The ozone layer has since begun to recover, but overall levels during 1998 to 2001 were still 3 percent lower, on average, than those observed 20 years earlier.

Tropospheric concentrations of total ozone-depleting substances have been slowly declining. Since 1994, total ozone-depleting substances in the troposphere have declined 11 percent, and this decline has contributed to the recent recovery in stratospheric ozone levels. The trends for individual ozone-depleting substances vary. Tropospheric concentrations of many ozone-depleting substances have declined since 1994, but concentrations of halons (fire extinguishing agents) and hydrochlorofluorocarbons (HCFCs), a class of chemicals being used to replace CFCs, increased.

Total Ozone Levels Over North America, 1965-2005



Total ozone refers to the total ozone concentration in a column of air between the Earth's surface and the top of the atmosphere.

Source: 1965-2003 data from World Meteorological Organization et al., 2003, and 2004-2005 data from unpublished results provided by World Meteorological Organization

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GREENHOUSE GASES

Some gases in the atmosphere trap part of the Earth's outgoing energy, which causes the atmosphere to retain heat and affect

climate. These gases are called greenhouse gases, and they include carbon dioxide, methane, nitrous oxide, and certain man-made chemicals. Some greenhouse gases occur naturally, while emissions due to human activities, such as electricity production and transportation, add to the natural concentrations in the atmosphere.

Greenhouse gases are important to track because increased concentrations cause the atmosphere to retain heat which, in turn, can affect various aspects of climate,

such as temperature, evaporation, and precipitation. Natural phenomena, like volcanic activity and variations in the sun's output, and other human activities, such as land use changes, also affect climate. Human health, agriculture, water resources, forests, wildlife, and coastal areas all can be affected by climate change.

National trends in greenhouse gases are characterized by tracking emissions of these gases from human activities and concentrations of these gases in the air.



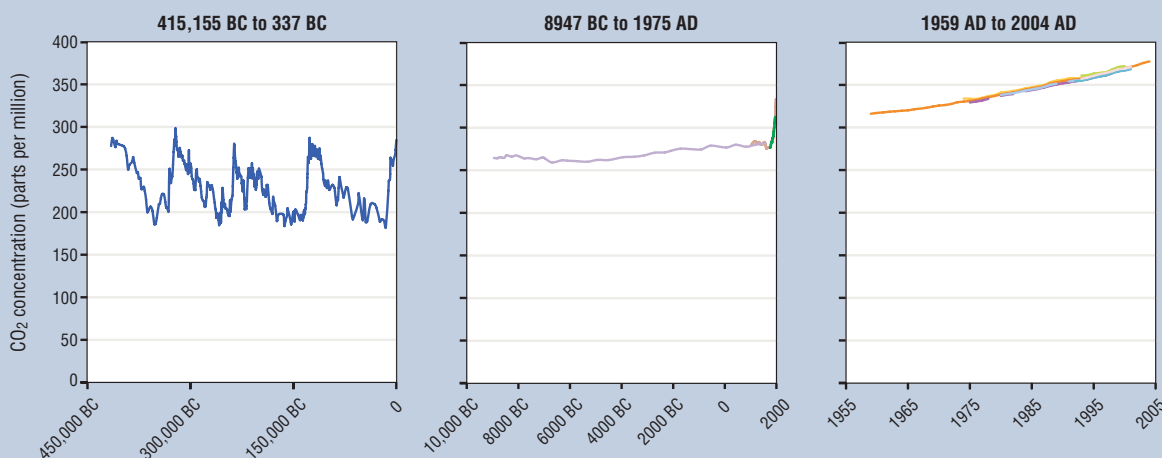
KEY POINTS

Concentrations of several important greenhouse gases have risen substantially over the past 100 years and are currently higher than at any time in the past 400,000 years. Gases trapped in ice over the past 400,000 years confirm that present concentrations of carbon dioxide (see graphic), methane, nitrous oxide, and certain synthetic chemicals are unprecedented in this period, even after accounting for natural fluctuations.

Between 1990 and 2003, U.S. greenhouse gas emissions from human activities rose 13 percent; the primary source of these emissions was fossil fuel combustion. Carbon dioxide makes up most of this increase. Energy use, primarily electricity generation and transportation, accounted for approximately 85 percent of the emissions in 2003.

While trends in emissions and concentrations of greenhouse gases are based on robust data, gaps remain. For both emissions and concentrations, trends have been quantified for several of the most important greenhouse gases, but not for every greenhouse gas.

Global Atmospheric Concentrations of Carbon Dioxide (CO₂) Over Geological Time and in Recent Years



The concentration data shown are reported in multiple scientific publications. Complete citations for these peer-reviewed publications are provided in the *Report on the Environment: Science Report*.

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INDOOR AIR

Many substances affect the quality of air inside homes, schools, workplaces, and other buildings.

Some of these contaminants come from outdoor air and building materials; others are produced by indoor activities such as cooking, smoking, and using cleaning materials. Natural substances, such as molds, can also affect indoor air quality.

Indoor air quality is important because Americans, on average, spend most of their time indoors. In addition, the indoor concentrations of some pollutants can exceed levels typically found outdoors. Health effects associated with indoor air pollutants include irritation of the eyes, nose, and throat; headaches, dizziness, and fatigue; respiratory diseases; heart disease; and cancer.

National indicators are available for two harmful substances found in indoor air: radon and environmental tobacco smoke. Radon is a naturally occurring radioactive gas found underground. It can seep into buildings through cracks in floors and walls, and is a risk factor for lung cancer. For homes with radon levels above EPA's radon action level, EPA recommends that occupants take action to protect their health—for example, by installing a mitigation system to reduce radon levels.

Environmental tobacco smoke is associated with numerous health effects, including coughing, heart disease, and lung cancer. Children are at particular risk from exposure to environmental tobacco smoke because they are still developing physically.

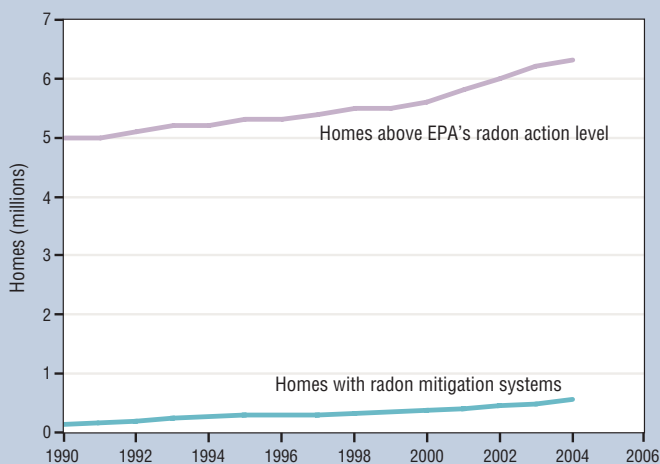
KEY POINTS

Between 1990 and 2004, both the number of homes with radon mitigation systems and the number of homes needing mitigation increased. Homes with mitigation systems rose from 155,000 to 577,000, and homes needing mitigation increased from 5 million to 6.3 million due to an increase in housing stock (see graphic). Thus, more than 90 percent of the nation's homes that exceed EPA's radon action level do not have mitigation systems, though some of these homes have been built with new, radon-resistant construction features to reduce radon exposures.

Over the past decade, exposure to environmental tobacco smoke among nonsmokers decreased considerably. All population groups, regardless of age, sex, or ethnicity, experienced this decrease, which was likely due to behavior changes such as reduced smoking and smoking restrictions in some public places. Exposure to environmental tobacco smoke is measured by blood levels of cotinine, a substance produced in the body when a person is exposed to nicotine. Among nonsmokers, children, on average, have more than twice the level of blood cotinine as adults.

National indicators currently are not available for a broader range of pollutants and substances found in indoor air. Scientists have studied numerous other indoor air quality issues, but the available information does not track trends over time or across the entire nation.

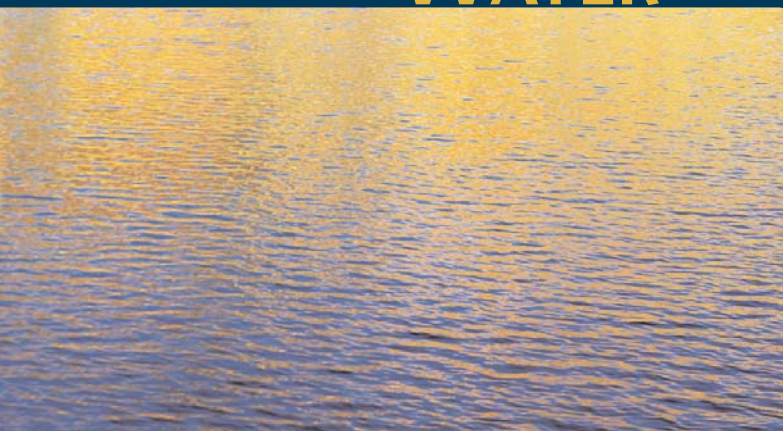
Radon in U.S. Homes, 1990-2004



Source: U.S. Environmental Protection Agency, "National Radon Residential Survey: Summary Report," 1992, updated with 2000 U.S. Census data, and U.S. Environmental Protection Agency, unpublished industry data on mitigation system sales, 2005

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WATER



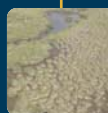
Fresh Surface Waters



Ground Water



Wetlands



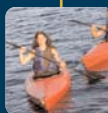
Coastal Waters



Drinking Water



Recreational Waters



Consumable Fish and Shellfish



From swiftly flowing streams to slow-moving water underground, the nation's water resources are integral to life. Water resources encompass water bodies (such as coastal waters, lakes, streams, ground water, and wetlands) and their associated ecosystems. They sustain a multitude of plant and animal species and provide for drinking water, irrigation, fishing, recreation, and many other needs.

The ability of water resources to support these functions depends on their extent and condition. The extent of a water resource refers to its depth, flow, volume, and area. Condition reflects the ability of a water resource to sustain ecological needs and human uses. The extent and condition of water resources can affect the health and well-being of people, ecosystems, and critical environmental processes.

In addition, because water is constantly cycling above and below the surface of the Earth, there are many connections between water resources and other parts of the environment. For example, fertilizers and pesticides used on land can leach into underground or surface water supplies. Also, emissions released into the air can be deposited, via rain or snow, into a lake or stream.

A variety of methods are used to collect data on water resources, including targeted monitoring of specific water resources and select sampling of locations deemed to be representative of a larger area. One of the challenges in assessing the extent and condition of water resources is that a single data collection method is rarely perfect for every situation. This chapter provides an overview of national-level trends where nationally consistent data are available, but does not describe the extent or condition of local water bodies or the full range of variations and extremes that occur within individual water bodies.

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FRESH SURFACE WATERS

Lakes, ponds, rivers, and streams sustain ecological systems and provide habitat for many plants and animals. They provide

drinking water for people and support agriculture, industry, hydropower, recreation, and other uses. Both natural processes and human activities influence the condition of these waters. For example, discharges of industrial contaminants, agricultural and stormwater runoff, air pollutants deposited into water, and invasive species can all affect water bodies.

A variety of biological, physical, and chemical characteristics are used to assess the condition of fresh surface waters. An important biological characteristic is the presence and diversity of bottom-dwelling (benthic) macroinvertebrate communities, such as insect larvae, mollusks, and worms. Some species of macroinvertebrates are

sensitive to disturbances in their habitat, such as pollution, while others are tolerant of disturbances.

Examples of physical characteristics are depth and flow. Major changes in stream flows can affect plant and animal species that have adapted to particular seasonal fluctuations in flow, such as those that require a period of low or no stream flow in their habitat at a certain time of year.

Key chemical characteristics include acidity and dissolved oxygen. Acidity in soils, lakes, and streams can harm aquatic species and ecosystems. Low dissolved oxygen content can also be harmful. Excess concentrations of the nutrients nitrogen and phosphorous (from sewage or agricultural runoff, for instance) can cause algae to bloom in water, blocking sunlight and depleting the oxygen needed by fish and other organisms.

KEY POINTS

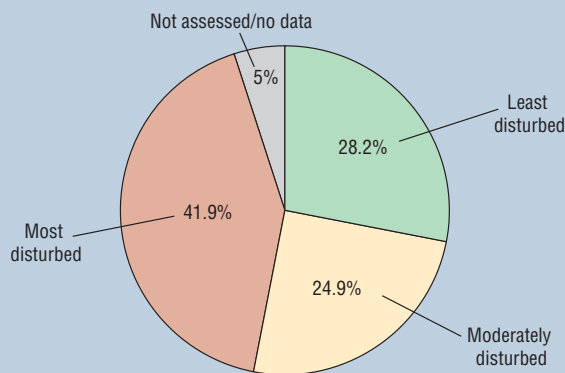
In about 42 percent of wadeable stream miles, benthic macroinvertebrate communities showed substantial disturbances; about 28 percent showed little disturbance (see graphic). Low biological diversity potentially indicates significant pollution and higher disturbance. By contrast, communities that are biologically diverse and include many pollution-sensitive species likely indicate that a stream is less disturbed. Wadeable streams are streams and rivers shallow enough to sample with boats.

More than 60 percent of streams and rivers measured in the 1990s showed major changes in the volume or timing of their high or low flows compared to a baseline period from 1930 to 1949. Also, the percentage of streams in largely arid grasslands and shrublands with no-flow periods decreased from 24 percent in the 1950s to 14 percent in the 1990s.

Fresh surface waters show a mixed picture of chemical condition. Acidity decreased in lakes and streams in some regions sensitive to acid rain; others showed little change. Approximately 30 percent of the nation's wadeable stream miles contained high nitrogen and phosphorus concentrations. Nitrate discharges increased in the Mississippi River. Phosphorus discharges decreased in the St. Lawrence and Susquehanna Rivers, but showed no change in trend in the Mississippi or Columbia Rivers.

National indicators are not available for many key stressors or for the extent of surface waters. Key stressors include pollution from various sources and toxic contaminants in sediments, which can impact water quality and potentially enter the aquatic food web.

Benthic Community Condition in Wadeable Streams, 2000-2004



Data gathered from 2000 to 2004 in the lower 48 states.

Categories based on the number and diversity of benthic species present, with "least disturbed" being the most diverse. Graphic shows the percent of stream miles in each category.

Source: U.S. Environmental Protection Agency, "Wadeable Streams Assessment," 2006

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GROUND WATER

More than 1 million cubic miles of fresh water lies underground, stored in cracks and pores below the Earth's surface. The vast

majority of fresh water available for human use is ground water, which has 30 times the volume of the world's fresh surface waters. Many parts of the country rely heavily on ground water for important needs such as drinking water, irrigation, industry, and livestock.

Some ecological systems also depend upon ground water. For example, many fish species depend on spring-fed waters for their habitat or spawning grounds.

Springs occur when a body of ground water reaches the Earth's surface. By some estimates, ground water feeds

about 40 percent of total national stream flow, and the percentage could be much higher in arid areas.

Human activities and natural factors can affect both the extent and condition of ground water. Pesticides, fertilizers, and wastes, as well as natural substances like arsenic, can contaminate ground water. For example, fertilizers and animal wastes can release nutrients such as nitrate.

Withdrawing too much ground water from a source can reduce the water depth in streams and lakes, affecting vegetation and wildlife habitat. It can also cause land to subside and sinkholes to form. Once depleted, some deep aquifers (underground geological formations containing water) can take thousands of years to recharge, affecting the supply of ground water available for future needs.

KEY POINTS

About 61 percent of shallow wells tested in agricultural areas contained pesticide compounds.

For 47 of the 83 pesticides for which standards or guidelines exist, fewer than 1 percent of these wells had concentrations of pesticides above the human health benchmark.

In about 21 percent of shallow wells, average nitrate concentrations exceeded the federal drinking water standard and were significantly higher than the levels generally found in areas with little human influence (see graphic). Public water systems must test for nitrate and treat the water if levels exceed federal health-based standards.

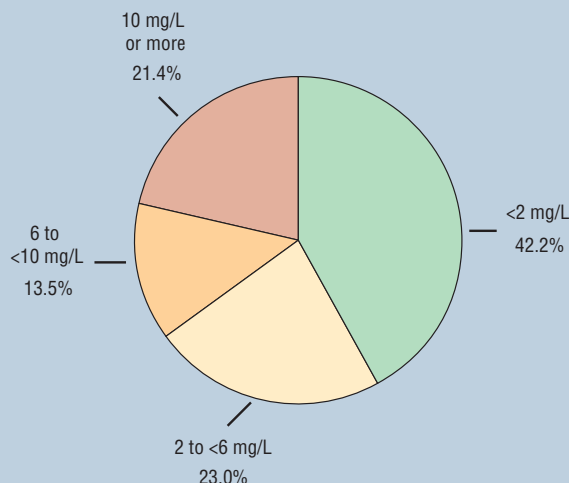
The data in this report do not provide information about the condition of deeper aquifers, which are more likely to be used for public water supplies.

These data only characterize the uppermost layers of shallow aquifers typically used by private wells. There are no national treatment or monitoring requirements for private wells; however, owners should test their water periodically to identify possible health risks.

There are no consistent national indicators for many aspects of ground water condition or extent. These aspects include the presence of chemicals other than nitrates and pesticides in agricultural areas and the condition of ground water in predominantly non-agricultural areas, including

urban areas. Localized events, such as chemical spills or leaks from underground storage tanks, can affect ground water in urban areas; such events are not easily captured in measures at the national level.

Nitrate Concentrations in Shallow Ground Water in Agricultural Watersheds, 1992-2001



Data gathered in a survey of 1,423 wells in the lower 48 states from 1992 to 2001. Graphic shows percent of wells in each category.

The federal drinking water standard for nitrate is 10 milligrams of nitrate per liter of water (10 mg/L).

Source: U.S. Geological Survey, National Water Quality Assessment Program, 2006

WETLANDS



Wetlands—areas that are periodically saturated or covered by water—are an important ecological resource. Wetlands are like sponges, with a natural ability to store water. They act as buffers to flooding and erosion, and they improve the quality of water by filtering out contaminants. Wetlands also provide food and habitat for many plants and animals, including rare and endangered species. In addition, they support activities such as commercial fishing and recreation.

Both losses and gains can occur in wetlands extent. Natural forces and human activities (such as hurricanes, sea level change, and certain agricultural and forestry practices) can affect wetlands through increased erosion and sedimentation. Draining or filling wetlands for agriculture or other development is the main cause of wet-

lands loss. Gains can occur when wetlands are created or restored.

Changes in the extent or type of wetlands can have major ecological impacts. For example, the conversion of a forested wetland to one with scrub and oak trees can change habitat types and alter the structure of plant and animal communities present. Such a conversion can occur through natural changes in plant communities or by clearing trees from a forested wetland.



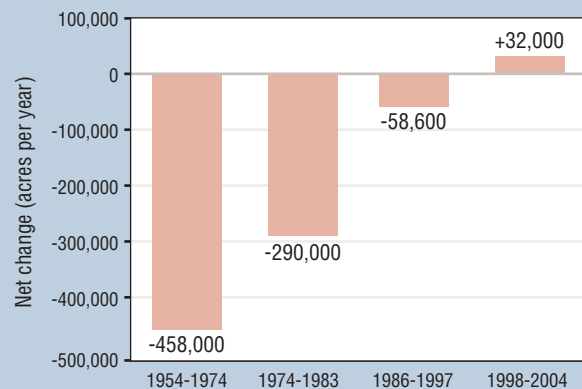
KEY POINTS

The overall extent of wetlands in the lower 48 states declined over the past 50 years. The rate of loss has slowed over time, however, and the most recent data show a net gain in wetlands acreage nationwide (see graphic). Gains and losses vary significantly by wetland type.

These data do not evaluate wetland quality or condition. Wetland condition is difficult to characterize fully, and there is no national indicator to measure it directly. This is partly because each wetland has unique characteristics, such as the movement and abundance of water, the minerals in the underlying soil, and the combinations of plant and animal species present.

National data do not capture locations or patterns of wetland change. Both are important for understanding condition—for example, whether large wetlands are being left intact, or are being fragmented into smaller pieces that are less connected, and therefore less able to perform their ecological functions.

Average Annual Change in Wetland Acreage, 1954-2004



Data gathered in the lower 48 states.

Source: Dahl, T.E., "Status and Trends of Wetlands in the Conterminous United States 1998 to 2004," 2006

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COASTAL WATERS

Coastal waters—the interface between terrestrial environments and the open ocean—encompass many unique habitats such

as estuaries, coastal wetlands, seagrass meadows, coral reefs, and mangrove and kelp forests. These ecologically rich areas support waterfowl, fish, marine mammals, and many other organisms.

Human activities and natural factors can affect the condition of coastal waters. Sewage overflow, agricultural runoff, storms, erosion, and sedimentation can all increase the amount of nutrients (such as nitrogen and phosphorus) and pathogens (disease-causing organisms) in coastal waters. Chemical contamination from industrial activities, electricity generation, and other sources are also concerns, as are invasive species and overharvesting of fish and other marine species.

Organisms that live in and on the ocean floor (benthic organisms) are a key measure of coastal water condition

because these organisms are sensitive to pollution. One important group of benthic organisms, known as benthic macroinvertebrates, includes worms, clams, crabs, and lobsters.

Scientists monitor several interlinked characteristics of water quality in coastal areas: nutrients, chlorophyll-*a*, dissolved oxygen, and water clarity. Plants need nutrients to grow, but in excess, nutrients fuel the growth of algae. High levels of chlorophyll-*a* indicate overproduction of algae. Too much algae leads to low levels of dissolved oxygen in the water and decreased water clarity. The resulting lack of oxygen and sunlight can harm plant and animal life.

Scientists also monitor plants that grow under water in coastal areas, known as submerged aquatic vegetation (SAV). Like all plants, SAV needs sunlight to grow and survive. Its growth can be affected by excess nutrients, as well as suspended sediments (loose particles of clay and silt in the water), which can block sunlight from reaching the plants.

KEY POINTS

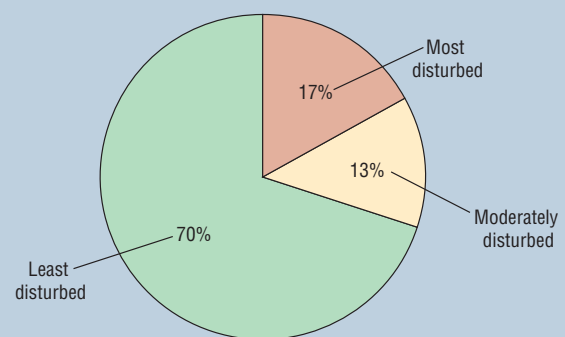
Coastal benthic communities in 70 percent of the areas sampled showed little evidence of disturbance (see graphic). The benthic communities in these areas showed high biological diversity and the presence of pollution-sensitive species, likely indicating that the waters were relatively unpolluted.

In the Chesapeake Bay, submerged aquatic vegetation (SAV) increased from 41,000 to 78,000 acres from 1978 to 2005. However, current acreage is still less than half of the historical coverage (from the mid-1930s). The extent of these plants is ecologically significant because the vegetation provides food and habitat for many organisms, adds oxygen to the water, filters sediments, inhibits wave action that erodes shorelines, and absorbs excess nutrients.

Elevated levels of nutrients and chlorophyll-*a* are present in slightly less than 10 percent of the nation's coastal waters. However, in areas such as the Gulf of Mexico “dead zone” and Long Island Sound, substantial areas of hypoxia (when dissolved oxygen is below levels necessary to sustain most animal life) remain.

There are no national indicators for the extent of coastal waters (except for coastal wetlands) and many aspects of their condition. For example, there are no indicators for invasive species, condition of coral reefs, or status of coastal fish and shellfish communities.

Benthic Community Condition in Estuarine Waters, 1997-2000



Data gathered in the lower 48 states and Puerto Rico from 1997 to 2000.

Categories based on the number and diversity of benthic species present, with “least disturbed” being the most diverse. Graphic shows the percent of estuarine area in each category. Estuarine areas are where the sea meets a freshwater stream or river.

Source: U.S. Environmental Protection Agency, “National Coastal Condition Report II,” 2004

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DRINKING WATER

Virtually all drinking water in the United States comes from fresh surface water and ground water.

These source waters can contain industrial, domestic, and agricultural contaminants, as well as naturally occurring contaminants such as arsenic and radionuclides. Also, some contaminants, such as lead from corroded pipes, can enter drinking water between the treatment plant and the tap. If these contaminants are present in drinking water at sufficient levels, they can lead to adverse health effects, including gastrointestinal illnesses, nervous system and reproductive effects, and chronic diseases such as cancer.

To protect public health, EPA sets federal health-based standards for drinking water for public water systems. Public water systems include community water systems—systems that supply drinking water to 25 or more of the

same people year-round in their residences. Community water systems serve more than 280 million people, or about 92 percent of the U.S. population.

Public water systems must test for regulated contaminants and treat the water, if needed, to meet the federal standards. Disinfection of drinking water effectively protects against the risk of waterborne disease such as typhoid, cholera, and hepatitis.

Filtration, required for most public water systems that use surface water, provides additional protection against microbial contaminants.



KEY POINTS

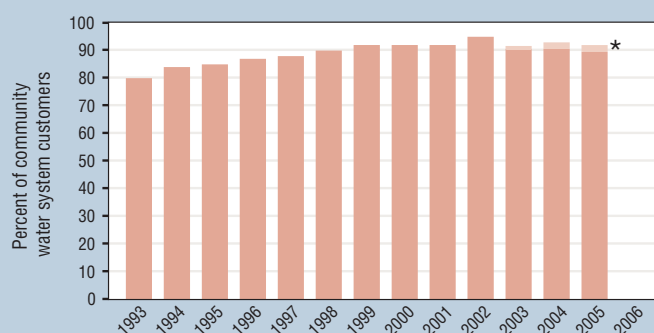
In 2005, 89 percent of community water system customers were served by facilities for which states reported no violations of EPA's health-based drinking water standards (see graphic).

Approximately 32 million people in 2005 were served by systems for which states reported violations of these standards. A portion, but not all, of these people might have been exposed to contaminants in drinking water at levels above standards. Most of these violations involved rules addressing microbial contaminants or disinfection byproducts (chemicals that can form when disinfectants, such as chlorine, react with naturally occurring materials in water). The level of health risk associated with violations varies, depending partly on which contaminants were involved, the extent to which a standard was exceeded, the extent to which the distribution system was affected, and how long the violation lasted. Microbial violations, in particular, can be short term.

These data address drinking water from community water systems only. They do not address the quality of drinking water that people get from non-public supplies (such as private wells and untreated surface water sources), from public water systems serving transient populations (such as roadside rest stops and campgrounds), or from non-residential users (such as some workplaces and schools). National data are not available for bottled water, which is regulated by the Food and Drug Administration.

National indicators are not available for health effects that could be caused by contaminants in drinking water. For example, no national indicator is available for disease occurrence or outbreaks caused by harmful microorganisms in drinking water.

Population Served by Community Water Systems With No Reported Violations of EPA Health-Based Standards, 1993-2005



*Several new standards went into effect after December 31, 2001. The lightly shaded portion of the 2003, 2004, and 2005 columns indicates what percent of the population would have been served by community water systems with no reported violations if these new standards had not gone into effect.

Data are presented by EPA fiscal year (October 1–September 30).

Source: U.S. Environmental Protection Agency, *Safe Drinking Water Information System, Federal Version, 2006*

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RECREATIONAL WATERS

People enjoy many recreational activities on the nation's rivers, lakes, and coastal waters. Several characteristics determine

whether these waters are suitable for recreation. For example, the levels of chemical contaminants and disease-causing microorganisms in water affect whether

the water is suitable for swimming, boating, and other contact activities.

The condition of ecosystems and the wildlife within them, which support recreational activities such as fishing and bird watching, is also important. While many of these characteristics can be measured at a local level, there are several barriers to compiling these data into national indicators.

KEY POINTS

While information exists about many individual water bodies, consistent national indicators for recreational waters are not yet available. Many states and localities collect information about individual water bodies in their region. States also monitor coastal beaches for levels of certain disease-causing bacteria and report the results to EPA. However, different states monitor in different ways (for example, by using different methods or monitoring more or less

frequently), making it difficult to compile the results into national indicators.

Improved data collection could lead to suitable indicators in several areas. For example, with a comprehensive national system for gathering data, scientists could develop consistent national indicators for bacteria levels at beaches.



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CONSUMABLE FISH AND SHELLFISH

Fish and shellfish are an important part of a healthy diet for many Americans. Some fish and shellfish from lakes, rivers, estuaries,

and deep ocean fisheries, as well as farmed fish and shellfish, can contain chemicals or disease-causing organisms at levels that can pose human health risks. Sources of these contaminants include runoff from urban and agricultural areas, pollutants deposited in water from the air, and direct discharges into water bodies.

Concerns about fish and shellfish safety are higher for people who eat a lot of fish, and groups of people—such as

infants, children, the elderly, and women who are pregnant or might become pregnant—who can be particularly vulnerable to contaminants that may be present in fish.

Of particular interest in measuring the condition of consumable fish and shellfish are chemicals such as mercury, polychlorinated biphenyls (PCBs), the pesticide DDT or diphenyl-trichloroethane, and polycyclic aromatic hydrocarbons (PAHs), which form during the combustion of oil, gas, and other organic substances). These compounds can persist in sediments for a long time, increasing their potential for entering the food web and ultimately concentrating in fish that may be eaten by people and wildlife.

KEY POINTS

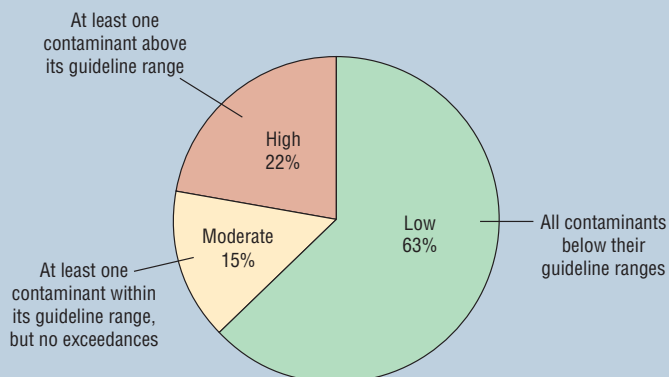
Coastal sites across the nation showed varying levels of contamination in fish tissue. Sixty-three percent of the sites showed “low” fish tissue contamination, 15 percent showed “moderate” contamination, and 22 percent had “high” contamination based on health-based consumption guidelines (see graphic). PCBs, mercury, DDT, and PAHs were most often responsible for high contamination scores. The condition of coastal fish varied significantly among different areas of the country. The survey did not include Hawaii, the Caribbean, the Pacific territories, or Alaska, which is notable because more than half the nation’s commercial fish are from Alaska.

Lake fish surveys found that several chemicals, including mercury, dioxins and furans, PCBs, and DDT, are widely distributed in the nation’s lakes and reservoirs. However, some other chemicals, including certain pesticides and PAHs, were detected rarely or not at all. These data do not consider whether the detected levels are a health concern. The surveys did not include Hawaii, the Caribbean, the Pacific territories, or Alaska.

While fish consumption advisories provide information on fish from many individual water bodies, these advisories cannot be compiled into a national indicator of fish and shellfish condition. The states and tribes that issue fish consumption advisories use different ways of monitoring waters and making advisory decisions, so the information is not comparable.

There are no consistent national indicators for disease-causing organisms in fish and shellfish, or for the biological and chemical condition of commercially farmed fish and shellfish.

Contaminants in Fish From Estuarine Waters, 1997-2000



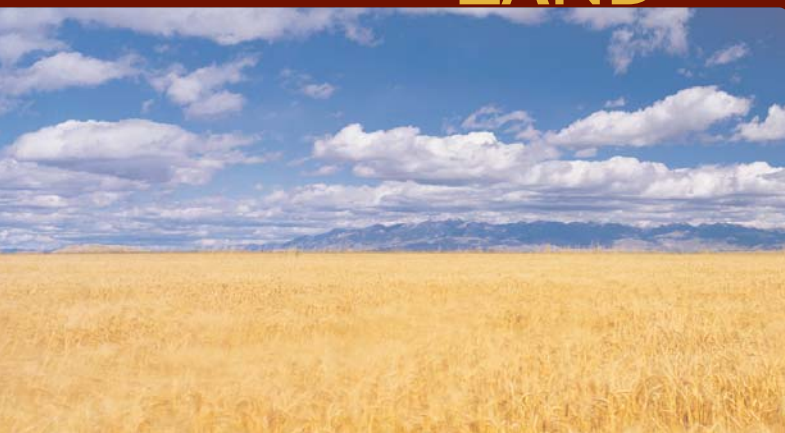
Data gathered in the lower 48 states from 1997 to 2000.

Categories are based on comparison to EPA's health risk guidelines for fish consumption. Graphic shows the percent of estuarine sites in each category.

Source: U.S. Environmental Protection Agency, “National Coastal Condition Report II,” 2004

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LAND



Land Cover



Land Use



Wastes and the Environment



Chemicals Applied and Released to Land



Contaminated Land



Land provides food, shelter, fuel, and raw materials for people, as well as habitat for many species. It is the source of many resources such as minerals, timber, and petroleum and helps to filter the nation's water and break down wastes and chemicals. While the amount of land in the United States is relatively constant, how land is used changes continuously. Changes in land use affect the distribution and nature of land cover (such as forests, developed land, and agricultural land) and the condition of land and its resources.

Land is intricately connected to other environmental resources and to human health. For example, land cover affects the energy exchange between the Earth's surface and atmosphere, which in turn influences climate and weather. Changes in land cover can increase or decrease erosion, water runoff, sedimentation, and flooding. Chemicals and wastes can affect human health and the environment when they are applied to or disposed of on land.

Many federal agencies with varying responsibilities collect data on land resources using satellite imagery, national surveys, and regulatory data. These data, in general, represent only a small sample of the total picture of land cover, land use, waste management and disposal, chemicals used on land, and land contamination. States also collect these kinds of data, but differ in their approaches, making it difficult to compile national data on land issues.

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LAND COVER

Land cover is the vegetation and other materials, such as rock, snow, or pavement, that are present and visible on land.

Satellite data are frequently used to identify land cover types over large areas. Land cover can be grouped into six major categories: forest cover, grass cover, shrub cover, developed land, agriculture, and "other" (which includes ice/snow, bare rock, and other types of land cover with limited extent).

Land cover differs from land use. Land cover is physically obvious, while land use is determined by a government agency or individual landowner and might not always be visible. Because of these differences, land cover acreages differ from land use acreages in the United States.

A number of factors affect land cover, including geology, climate, population changes, and human activities such as industrial and urban development, deforestation or reforestation, water diversion, and road building. The extent and type of land cover in an area can affect habitat quality and availability, species distribution, water quality, climate, and distribution and movement of chemicals.

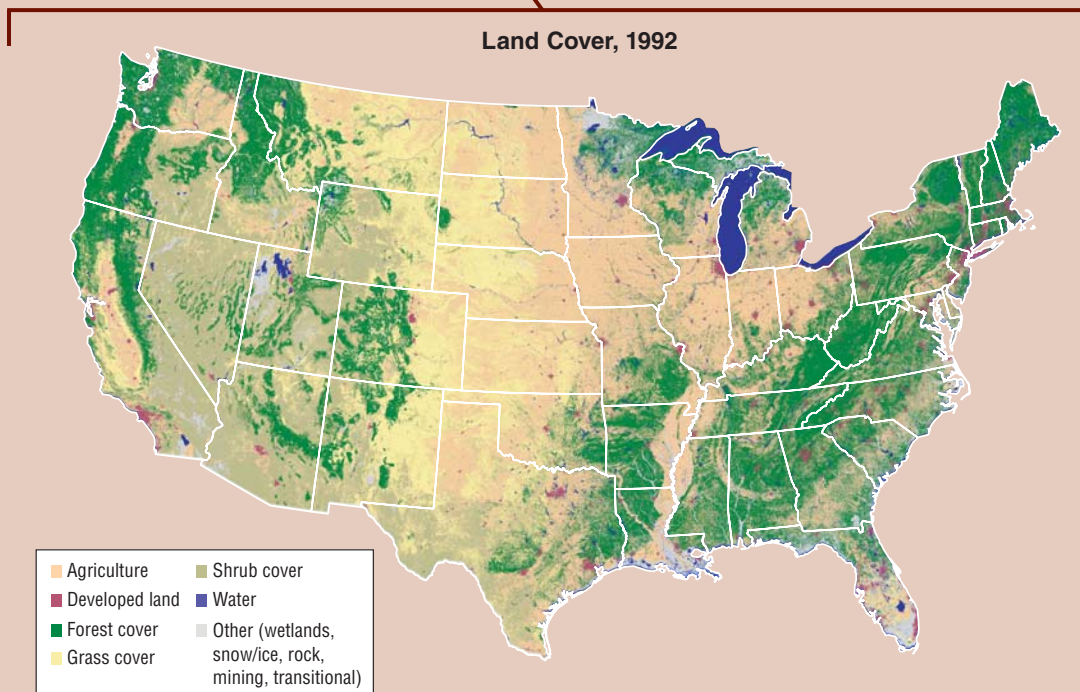
KEY POINTS

Forest cover and agriculture account for the two largest acreages of land cover in the United States. In 1992, of the approximately 2.3 billion acres of land in the nation, 694 million acres were forest cover, 510 million acres were agriculture, 350 million acres were shrub cover, 307 million acres were grass cover, and 41 million acres were developed land. These estimates were derived from satellite data.

Land cover types vary significantly by region (see graphic). Forest cover is predominant in the eastern and Pacific northwest states, agriculture in the north central states, grass cover in the central states, and shrub cover in the Pacific southwest states.

The total amount of forest in the United States has remained relatively constant over recent years, but regional variations exist. Forest cover has increased in the Mid-Atlantic and Midwest and decreased in the south central states and the Pacific Southwest.

Comparing and integrating land cover information is difficult. Different agencies collect data on land cover, often at varying times and for different purposes. These agencies also define and classify land cover differently and at varying levels of detail. The most recent comprehensive data available are from 1992; satellite data from 2001 are under development.



Source: U.S. Geological Survey, 1992 National Land Cover Dataset

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LAND USE

U.S. lands support many uses, including crop production, timber production, livestock grazing, recreation, and residential and

commercial development. Designated through zoning and other regulations, these uses are often less physically obvious than land cover. For example, “developed land use” can include land that has visibly developed features, such as asphalt, concrete, and buildings, as well as undeveloped land designated for residential or transportation use.

Land use can adversely affect numerous aspects of the environment, including air and water quality, habitat availability, and species distribution. In some cases, land

use can also have positive environmental effects, such as when communities restore habitats or clean up and redevelop contaminated lands.



KEY POINTS

Grazing, timber production, and food crop production account for the three largest acreages of land use in the United States. As of 2002, of the approximately 2.3 billion acres of land in the nation, as many as 720 million acres were used for grazing, 504 million acres for timber production, 370 million acres for food crop production, and 107 million acres for development. These data are based on aerial photo interpretation and ground surveys.

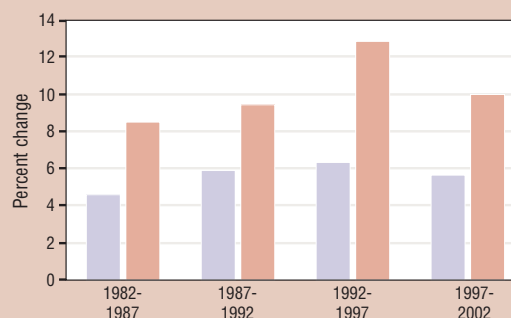
Land use patterns vary significantly by region of the country. More than three-quarters of the nation’s grazing land is in the West, and just under half the timberland is in the East.

The amount of land used for crop production and pasture has declined since 1982, while the amount of developed land has increased, and timberland has remained constant. Conversions of forestland, cropland, and pastureland have contributed to the increases in developed land. Additionally, highly erodible cropland has been removed from production.

Between 1982 and 2002, the amount of developed land in the United States increased at nearly twice the rate of the population (see graphic). The amount of developed land grew by about 47 percent, while the population grew by just over 24 percent. Population and development trends varied in different parts of the county. For example, in the West, the amount of land developed closely matched population growth. In the Northeast, the amount of developed land increased by nearly 36 percent, while population grew by 9 percent.

The data to track land use trends are limited and derived from many sources, which inhibits the ability to track changes over time. Various agencies collect land use data, often at different times and for different purposes. Classifications of land use can also vary, making it difficult to integrate and compare data.

Change in Population and Developed Land, 1982-2002



Data gathered in the lower 48 states and Hawaii, except for 1997-2002, when data on developed land were not available for Hawaii.

■ Change in population
■ Change in acreage of developed land

Source: U.S. Census Bureau, 1996, 2002, 2005. U.S. Department of Agriculture, Natural Resources Conservation Service, 2000, 2004

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WASTES AND THE ENVIRONMENT

The amount, composition, and management of wastes provide insight into the nation's efficiency in using materials and

resources. Such information also can be useful in understanding the effects of wastes on human health and the environment. The type and amount of waste produced in the United States varies and can depend on the size and activities of an organization. For example, households primarily produce municipal solid waste (paper, packaging, yard trimmings, and other materials) and small amounts of hazardous waste. Commercial entities and institutions produce municipal solid waste, industrial waste, and larger quantities of hazardous waste. Hazardous wastes have properties (toxicity, corrosiveness, ignitability, reactivity) that make them potentially harmful to human health or the environment.

Activities such as agriculture, construction/demolition, mining, and other resource extraction and industrial processes generate large quantities of other types of waste. Presently, however, the United States regularly collects information on only municipal solid waste and hazardous waste. These two types of waste make up a small fraction of all of the waste generated in the country.

Once wastes are generated, they must be managed—collected, transported, stored, reused, recycled, processed or treated, or disposed of. Because wastes can contain hazardous chemicals, both their generation and management have the potential to contaminate land, compromise its use, or affect human health and ecological conditions. For example, landfills have been a significant source of methane over the last decade. In contrast, industry has taken steps to reduce certain high-priority chemicals (documented contaminants of air, water, land, plants, and animals) found in waste in recent years.

KEY POINTS

Since 1990, the per capita municipal solid waste generation rate has remained stable at 4½ pounds per person per day. As the U.S. population has increased, however, the nation has steadily generated more municipal solid waste. Generation increased from 88 million tons in 1960 to 236 million tons in 2003.

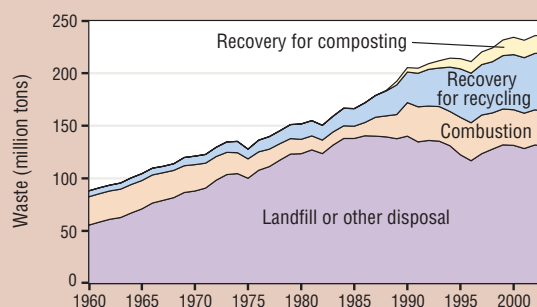
Hazardous waste generation has declined. Hazardous waste generation dropped from nearly 36 million tons in 1999 to 25 million tons in 2003.

Recycling or composting of municipal solid waste increased from 6 to 31 percent over the past four decades (see graphic). Hazardous waste recycling rose only slightly between 1999 and 2003 and remains at less than 10 percent.

Most waste is still disposed of on land. In 2003, 55 percent of municipal solid waste was disposed of in landfills, compared to approximately 63 percent in 1960 (see graphic). Ninety-two percent of hazardous waste was injected deep into the ground in permitted wells, and the remaining 8 percent was treated and disposed of in a manner to minimize risk to human health and the environment.

Information about many types of waste is not currently available at the national level. Also, data are lacking about exposure and the effects of waste and management practices on human health and the environment. The potential effects associated with waste vary widely and are influenced by the substances or chemicals found in waste and how they are managed.

Municipal Solid Waste Management, 1960-2003



Source: U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, 2005

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CHEMICALS APPLIED AND RELEASED TO LAND

Chemicals are commonly used in manufacturing, in food and consumer products, and in efforts to manage diseases. They

can be intentionally applied to land for purposes of increasing crop yields and controlling pests, or in some cases, accidentally spilled on land. Some chemicals also occur naturally or can enter the environment through acts of nature, such as volcanoes and hurricanes.

Chemicals released or applied to the environment can pose a range of challenges to human health and the environment. Some chemicals break down quickly in the environment, while others persist for long periods of time and can accumulate in the food web. The volume or mass of a chemical is not proportional to its toxicity.

Some chemicals have no known health effects, but others can lead to health problems if people are exposed to them in sufficient quantities. The effects of long-term exposure to chemicals are often unknown. In addition, some chemicals can harm ecosystems, such as

excess fertilizers carried in runoff, which can affect water quality and aquatic life.



KEY POINTS

Certain toxic chemicals in industrial waste materials decreased by more than 4 billion pounds (14 percent) between 1998 and 2003 (see graphic).

These chemicals are subject to reporting to EPA under the Toxics Release Inventory (TRI) program. Only chemicals subject to a consistent set of annual reporting requirements for all years from 1998 to 2003 are shown. In 2003, the quantities of TRI chemicals associated with production-related wastes totaled nearly 24 billion pounds. The metal mining industry accounted for 38 percent of the total TRI chemicals in production-related wastes released to the environment.

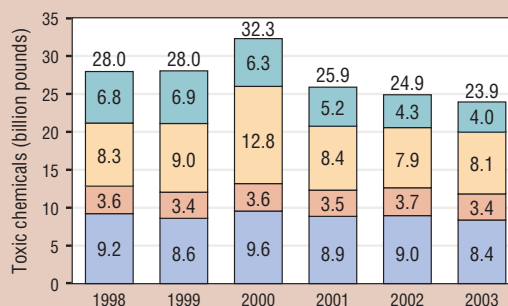
Over the past 40 years, the use of fertilizers, including nitrogen, phosphate, and potash, has increased nearly three-fold. The combined use of these three chemicals rose from 46 pounds per acre per year in 1960 to 131 pounds per acre in 2003. Nitrogen accounted for the steepest increase. While fertilizers are not inherently harmful, they have the potential to contaminate ground and surface water when applied improperly or in excessive quantities.

In recent years, food samples showed declining amounts of detectable pesticide residues. In 1994, 38 percent of the food sampled showed no detectable amounts of pesticide residue. By 2002, 58 percent showed no detectable amounts. Foods tested include fruits, vegetables, grains, meat, and dairy products.

Data about chemicals used on land are limited.

Some data are available on pesticide and fertilizer use on agricultural lands. Agencies collect national information on only a fraction of all chemicals used in the United States, however. Consistent national indicators are lacking regarding when, where, and how frequently chemicals are applied to land and the potential impact when they contain toxic constituents.

Disposition of Toxics Release Inventory Chemical Waste, 1998-2003



Source: U.S. Environmental Protection Agency, Toxics Release Inventory, 2005

Released
Treated
Recovered for energy
Recycled

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CONTAMINATED LAND

Contaminated lands range from abandoned properties in inner cities to large areas of land once used for industrial or mining activities. Improper handling or disposal of toxic and hazardous materials and wastes, deposition of toxic substances on land via winds or water, and accidental spills can all contaminate land. Except for spills and natural events, most land contamination is the result of historical activities that are no longer practiced.

The Comprehensive Environmental Response, Compensation, and Liability Act, also known as “Superfund,” and the Resource Conservation and Recovery Act (RCRA) are two of the major federal laws governing contaminated lands to protect human health and the environment.

The most toxic abandoned waste sites in the nation are listed on the Superfund National Priorities List (NPL). High-priority facilities subject to cleanup under RCRA are included in the RCRA Cleanup Baseline.

Completing cleanups at these complex sites can take years and even decades; therefore, EPA tracks whether people are coming in contact with contamination above levels of concern, and whether contaminated ground water is spreading above levels of concern.



KEY POINTS

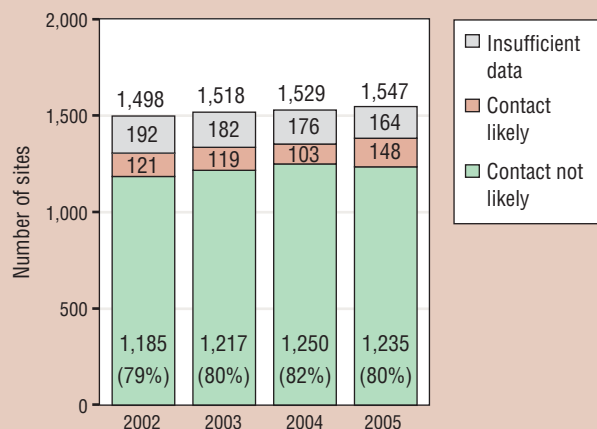
Between 2002 and 2005, the percentage of Superfund NPL sites where human contact with contamination was not reasonably expected to occur remained relatively constant at 80 percent (see graphic). However, between 2000 and 2005, the percentage of RCRA Cleanup Baseline sites where human contact with contamination was not reasonably expected to occur increased from 37 to 96 percent. These increases were partly due to actions to prevent contact with contamination and partly the result of sites with insufficient data being reclassified after completing site investigations. During these periods, the total number of Superfund NPL sites increased from 1,498 to 1,547, while the number of RCRA Cleanup Baseline sites remained constant at 1,714.

Between 2002 and 2005, sites where contaminated ground water was not spreading above levels of concern increased from 51 to 61 percent of Superfund NPL sites and from 32 to 78 percent of RCRA Cleanup Baseline facilities. The increases were partly due to actions to mitigate the spread of contaminated ground water and partly due to the completion of site investigations.

The total number and extent of contaminated sites nationwide is not known, nor are their specific effects on human health and the environment. Although EPA tracks the most contaminated sites

through the RCRA Cleanup Baseline and Superfund NPL, these sites do not represent the full extent of contaminated land in the United States. Many other sites managed by local, state, and other federal authorities are not inventoried at the national level.

Human Contact with Contamination at Superfund National Priorities List (NPL) Sites, 2002-2005



“Contact likely” means that there is a reasonable expectation that humans are exposed to contamination above health-based standards.

Data are presented by EPA fiscal year (October 1 - September 30).

Source: U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, 2006

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HUMAN HEALTH



Health Status



Diseases and Health
Conditions



Exposure to Environmental
Contaminants



Many factors can influence human health, including exposure to environmental contaminants. People can be exposed to environmental contaminants in a variety of ways, and many contaminants are known or suspected of causing human disease. The relationships among environmental contaminants, exposure, and human disease are complex, however. Despite these complexities, studying overall patterns of disease or exposure helps determine where further study or public health interventions could be needed.

For people to experience adverse health effects from exposure to an environmental contaminant, various events must occur. First, a contaminant released from its source requires some sort of contact (via air, water, or land) with a person and then must enter the body through inhalation, ingestion, or skin contact. Additionally, a contaminant needs to be present within the body at sufficient doses to ultimately result in a health effect. Understanding the connections between environmental exposure and adverse health effects is particularly challenging because many risk factors other than the environment—including genetics, personal behavior, and health care—also affect health.

Health and exposure data are drawn from many sources. These include records of vital statistics, such as births and deaths; surveys and questionnaires; and surveillance activities, such as cancer registries and other systems. As used in this report, these data are representative of the national population. They are not based on data from targeted populations or tied to specific exposures or releases.

At present, national-level health and exposure indicators cannot be used to demonstrate a cause-and-effect relationship between exposure to an environmental contaminant and an adverse health effect. Instead, these national-level data can help researchers track overall trends in population health, disease, and exposure, including trends across different age, gender, race, and ethnic groups.

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HEALTH STATUS

A nation's health status can be measured in many ways. Life expectancy and death rates are generally regarded as good overall measures of population health because they represent the combined effects of many different risk factors. Infant death rates are particularly useful because they indicate the current health status of the population, predict the health of the next generation, and reflect the overall state of maternal health.

Tracking these kinds of broad health measures helps to identify general patterns in the nation's health status and lay a foundation for studying trends in specific diseases and conditions. In addition, such tracking can help identify possible environmental factors that could contribute to the diseases or conditions that are the leading causes of death in the United States.

KEY POINTS

Overall, the health of the U.S. population has continued to improve. Mortality rates continue to decline, and life expectancy continues to increase, due to factors such as improved medical care over the past few decades.

Life expectancies in the United States are lower than in many other countries. In 2003, the United States ranked 34th in life expectancy for men and 35th for women among the 192 nations and states that are members of the World Health Organization.

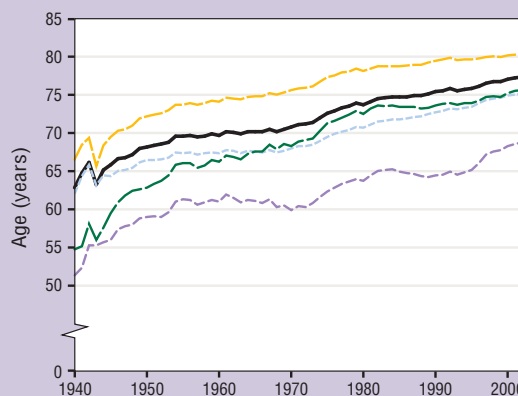
The three leading causes of death in the United States—heart disease, cancer, and stroke—remain unchanged since 1999. Measures of premature death show that injuries are the leading cause of death, followed by cancer and heart disease.

Infant mortality in the United States shows a long-term decline, although it remains among the highest in the industrialized world at seven deaths per every 1,000 live births in 2002. In 2002, U.S. infant mortality increased for the first time since 1958. U.S. infant mortality rates were two to three times higher than the lowest rates reported worldwide.

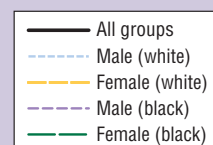
Although national health is generally improving, racial, ethnic, and gender differences persist. The mortality rate for black infants is still more than twice that of white or Hispanic infants. The gap in life expectancy between the black and white populations, and male and female populations, is approximately five years (see graphic). In 2003, mortality rates were almost a third higher for black Americans than for white Americans. Currently, data available for other racial or ethnic groups enable only limited analysis.

Life expectancy and death rates do not address other aspects of health such as perceived well-being or quality of life. Though life expectancy and death rates are widely accepted measures of health status, they alone do not completely describe the nation's health.

Life Expectancy by Race and Sex, 1940-2003



Source: National Center for Health Statistics, United States life tables, 2006



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DISEASES AND HEALTH CONDITIONS

Exposure to environmental contaminants has been linked to many human diseases and conditions, including cancer, cardio-

vascular disease, respiratory disease, some infectious diseases, and low birthweight, among others. These links have been established through well-designed studies with specified populations and specific environmental exposures. Many other risk factors can also lead to these diseases and conditions, however. For all the diseases

and conditions described here, exposure to environmental contaminants is one of the associated risk factors.

Tracking the occurrence of these human diseases and conditions at the national level helps identify general patterns or trends over time and across subgroups. Some notable differences are seen across different age groups, races, or ethnic groups for many conditions, such as heart and lung conditions, cancer, asthma, and some birth outcomes, such as birth defects, one-term deliveries, and low birthweight.

KEY POINTS

As the U.S. population ages, many chronic diseases—including various cancers and heart and lung diseases—are occurring more frequently in adults. For a number of these diseases, however, occurrence has stabilized in recent years. The annual incidence (proportion of new cases in a year) of cancer increased slowly from the early 1970s to the early 1990s and then leveled off. Rates for cardiovascular disease and chronic obstructive pulmonary disease remained fairly constant between 1997 and 2004, though death rates associated with these diseases declined.

There has been a slight rise in the incidence of cancer in children ages 0 to 19 years since the early 1970s. Leukemia and cancers of the brain and nervous system remain the leading cancers in children. White children develop cancer almost twice as often as black children.

Asthma rates are higher in children and adolescents than in adults, with some distinct patterns across races (see graphic). Between 1980 and 1996, childhood asthma rates increased about 4 percent each year, with no major shifts observed since 1997. Based on data from 2004, approximately 9 million children (about one in eight) in the United States have asthma. American Indians/Alaska Natives and blacks experience the highest asthma rates, compared to those reported in other races. Rates are lower in Hispanic/Latino children and adults than in non-Hispanics/Latinos.

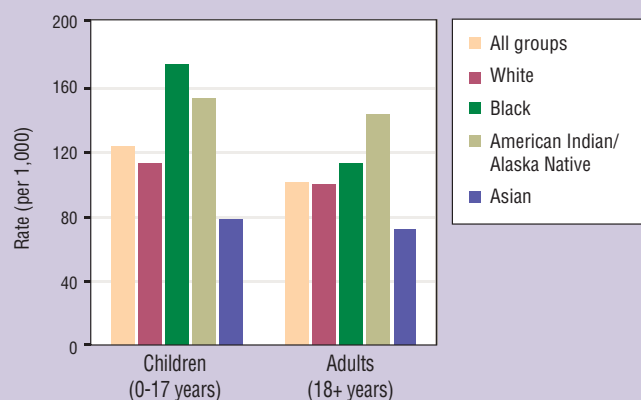
No notable patterns were observed for most reportable infectious diseases between 1995 and 2004. However, some increases were reported in 2002, 2003, and 2004 in Lyme disease, Rocky Mountain spotted fever, and Legionnaires' disease.

The proportion of mothers that gave birth early (before 37 weeks of gestation) increased by 14 percent since 1990, with a smaller increase from

1995 to 2002. Data from 1995 to 2002 also show that black mothers were about one-and-a-half to two times more likely to give birth early than white mothers. Also, black babies born at full term were more likely to have a low birthweight (less than 2,500 grams, or 5 pounds 8 ounces) than white babies.

These indicators provide important insights on disease patterns, but cannot be used alone to understand the role of environmental exposures. This is because these diseases and conditions are linked to other causes besides environmental exposures. Also, national indicators are not available for other diseases with possible environmental links, such as behavioral and reproductive disorders, and other diseases still being studied for possible connections to the environment, like Alzheimer's disease and diabetes.

Asthma Prevalence by Race, 2002-2004



Asthma prevalence represents individuals who were ever told that they have asthma.

Data were collected from 2002 to 2004.

Source: National Center for Health Statistics, "Health Data for All Ages," 2006

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EXPOSURE TO ENVIRONMENTAL CONTAMINANTS



People are exposed to many different contaminants in the environment. Although researchers can measure the levels of contaminants in air, water, and land, these measurements cannot reveal whether, or how much of, those chemicals have contacted or entered people's bodies. Biomonitoring is used to measure internal body levels of a contaminant (or substances produced when the body interacts with the contaminant) in human blood, urine,

or tissues. This type of direct measure offers more information about the extent of exposure to people than environmental levels alone.

Biomonitoring data can help track levels of people's exposure to environmental contaminants, but cannot be used to determine how people might have been exposed to a contaminant, or in most cases whether they will become sick. Currently, biomonitoring techniques exist for only a few of the many environmental contaminants.

KEY POINTS

Blood lead levels show a steady decline since the 1980s. Lead can harm the brain, nervous system, and other organ systems. Children aged 1 to 5 years have the greatest health risk from lead exposure because their systems are still developing. Between 1999 and 2002, 1.6 percent of children aged 1 to 5 years had elevated blood lead levels, decreasing from 88 percent in the late 1970s. The Centers for Disease Control and Prevention define elevated blood lead levels as 10 micrograms of lead per deciliter of blood.

About 6 percent of women of child-bearing age had at least 5.8 parts per billion of mercury in their blood from 1999 to 2002. EPA has determined that children born to women with blood concentrations of mercury above 5.8 parts per billion are at increased risk of adverse health effects.

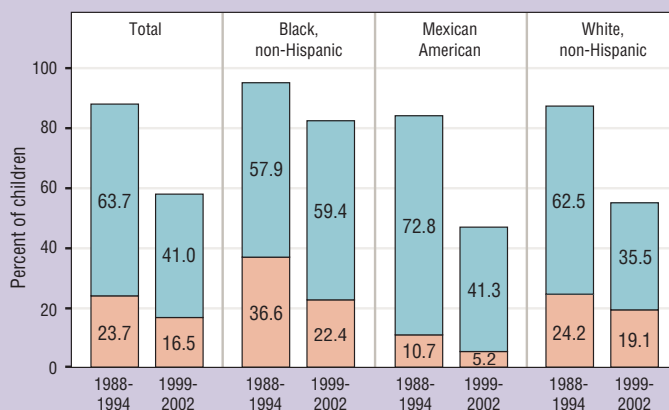
Exposure to environmental tobacco smoke among nonsmokers decreased considerably in the last decade (see graphic). Nonsmokers who are exposed to environmental tobacco smoke can have elevated levels of cotinine in their blood. Cotinine is a substance that forms in the body following exposure to nicotine.

Baseline measurements of exposure are also available for other biomonitoring indicators. These include cadmium, a metal that enters the environment through natural and man-made processes; phthalates, used to soften and increase flexibility of plastics and vinyl; persistent organic pollutants (POPs); man-made chemicals (such as polychlorinated biphenyls, dioxins, and furans) that can remain in the environment for years or decades; and pesticides, including chemicals to control weeds, insects, and other organisms.

These baseline measurements can be used in the future to track possible trends.

Biomonitoring data currently have limitations as indicators of exposure. Because biomonitoring data do not include the sources of exposure, these indicators alone do not indicate whether measured levels are related to environmental exposures.

Blood Cotinine Concentrations in Children Aged 4-17 by Race and Ethnicity, 1988-1994 Versus 1999-2002



Cotinine concentrations are reported for nonsmoking children only.

Concentrations are measured in nanograms of cotinine per milliliter of blood (ng/mL).

Concentration:

0.05 to 1.0 ng/mL

More than 1.0 ng/mL

Source: Forum on Child and Family Statistics, "America's Children in Brief: Key National Indicators of Well-Being," 2005; data collected by the National Health and Nutrition Examination Survey (NHANES)

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ECOLOGICAL CONDITION



Patterns in
Ecological Systems



Biological Diversity



Ecological Processes



Physical and
Chemical Attributes
of Ecological Systems



Ecological Exposure
to Contaminants



Ecological condition refers to the state of the physical, chemical, and biological characteristics of the environment and the processes and interactions that connect them. Ecological condition reflects a wide array of factors, including the natural development of plant and animal communities, natural disturbances, resource management, pollution, and invasive species.

One approach to assessing the nation's ecological condition is to examine its essential attributes, including the extent, distribution, and diversity of ecosystems; ecological processes; physical and chemical attributes; and exposure to pollutants.

Human activities and natural factors can directly or indirectly affect one or more of these attributes, resulting in changes to an ecological system. For example, plant growth might increase in response to heavy rainfalls or decrease in response to contaminant exposure. Such changes can affect the way an ecosystem functions and can have positive or negative consequences for society—such as by altering crop, timber, or fishery yields.

Measuring the nation's ecological condition is challenging. It is not as straightforward as measuring pollutant levels in air, water, and soil. For example, there are numerous groups of animals and plants, and indicators are available for only some of these. Major groups known to be undergoing changes, such as amphibians, are not captured by the available indicators.

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PATTERNS IN ECOLOGICAL SYSTEMS

Ecological systems—ranging from forests and watersheds to wetlands and coral reefs—make up the environment. Changes in

patterns of the extent and distribution of ecological systems have a fundamental influence on the health of the planet and the people who depend on these systems. For example, the extent of a forest affects both air and water quality, while the type of trees in a forest influences ecosystem structure and function, including which animals and plants are present.

Ecological systems are not isolated, but connected to one another. Connectivity refers to the way in which matter, energy, and organisms flow within and among ecosystems. Fragmentation refers to the breaking up of an ecological system into smaller, more isolated parts. When ecological systems become fragmented, habitat is

broken up into patches interspersed with other habitat types that may not support the species that were originally present.

Patterns in ecological systems can change naturally over time as a result of geological and climatic changes, or more quickly due to events such as extreme weather or wildfires. They also can change in response to human activities, such as urbanization, agriculture, forest management, and introduction of invasive species.

The impact of such changes varies significantly depending on their geographic scale. For example, a storm could create a gap in a forest canopy that only affects the immediate area for several decades. In contrast, widespread loss of wetlands over a large region could permanently shift bird migration routes or make coastlines more vulnerable to hurricanes.

KEY POINTS

Over the past century, the total amount of forest land has remained relatively constant, although forest types have changed regionally (see graphic). This change is primarily due to changing agriculture and development patterns. Forest extent has increased in the Mid-Atlantic and Midwest and decreased in the West and Southwest. Although total forest extent has decreased in the West, acreages of fir-spruce and other forest types have increased over the past 50 years, while other forest types, including many pine forests, have decreased.

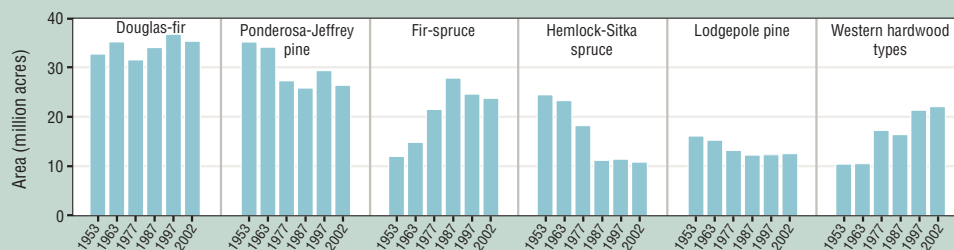
Nationwide, 47 percent of forests are highly fragmented. Human activities cause most of the forest fragmentation in the East, while natural factors, such as arid southern slopes, rock outcroppings, and forest fires, cause most of the fragmentation in the West.

Some ecological systems remain highly connected and intact. In the Northeast and Pacific Northwest, no fragmentation has been observed in more than 30 percent of

the forests. In the Southeast, about 40 percent of the forest, wetlands, and open water ecological systems remain connected to each other.

Much of the information about patterns of ecological systems is more than a decade old, limiting the ability to track recent trends. Little information is available on the extent of ecological systems other than forests and wetlands, or about the effects of fragmentation on biodiversity and ecological processes at different geographic scales.

Timberland Area in the West by Forest Type, 1953-2002



Graphic depicts data for states in the western United States (including Alaska and Hawaii), based on U.S. Department of Agriculture Forest Service reporting regions (see map at right).

Data Source: Smith et al., "Forest Resources of the United States, 1997" and "Forest Resources of the United States, 2002," 2001 and 2004



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BIOLOGICAL DIVERSITY

Biological diversity, or biodiversity, refers to the amount of variation within biological systems.

This diversity encompasses multiple levels—from the genetic makeup of a single organism to the composition of an entire ecosystem. Biological diversity provides many tangible benefits to society, including medicines and crops; for many people, it also contributes in important ways to the quality of life.

Trends in the number and composition of species within an ecological system are important indicators of its health and robustness. Scientists generally agree that as the number of species in an ecological system declines, the system is less able to recover from stress. These relationships are not straightforward and can vary in degree, depending on the types of species introduced or removed from a system.

Diversity arises over time when adaptation results in new species that fill available niches in the environment. This is a dynamic process involving colonization,

evolution of species adapted to new conditions, and extinction of species that are less well adapted to a changing environment. This process has occurred over millions of years across large geographic areas, punctuated occasionally by significant natural events such as meteor strikes, periods of intense volcanic activity, and ice ages.

Human activities—such as urbanization, water management practices, and land-use changes—can have profound effects on biological diversity, and in a much shorter timeframe. For example, in sewage-polluted waters, dense beds of a single species, sludgeworms, can replace the more diverse communities of bottom-dwelling organisms ordinarily present. Invasive species also can have widespread effects. When the sea lamprey was introduced to the Great Lakes, for instance, sweeping changes occurred throughout the entire food web.



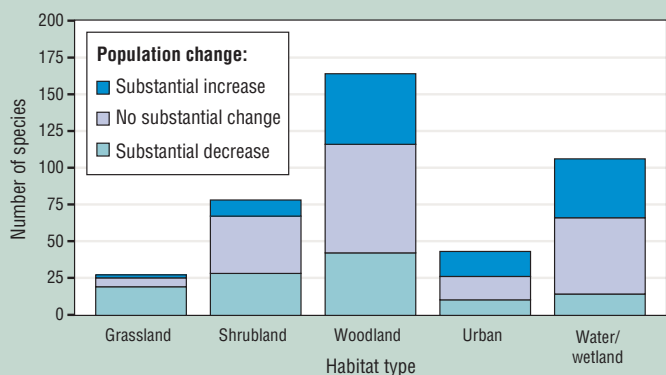
KEY POINTS

Over the past four decades, watersheds covering about 24 percent of the land in the lower 48 states have lost one tenth of their freshwater fish species. Losses were especially severe in the Southwest and the Great Lakes, where eight major watersheds lost more than half their native fish. Fish diversity can decline from a number of different factors, such as pollution, habitat alteration, fisheries management, and invasive species. In contrast, watersheds covering about 21 percent of land area have retained their entire composition of species.

In recent years, changes (both decreases and increases) have occurred in bird populations in various habitats. Changes in bird populations reflect changes in landscape and habitat, food availability and quality, toxic chemical exposure, and climate. Since 1966, substantial decreases occurred in 70 percent of grassland species and 36 percent of shrubland species. Substantial increases occurred in 40 percent of urban species and 38 percent of water and wetland species (see graphic).

Consistent national indicators are not available for several aspects of biological diversity. These include major groups of animals such as amphibians, reptiles, and mammals; plants; and the numbers of threatened, endangered, and invasive species.

Change in Bird Populations by Habitat Type, 1966-2003



Data gathered by the North American Breeding Bird Survey, which covers the lower 48 states and southern Canada.

Substantial increases or decreases are those in which the observed populations increased or decreased by more than two-thirds.

Source: Audubon Society, "State of the Birds USA 2004," 2004

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ECOLOGICAL PROCESSES

Ecological systems are sustained by biological, physical, and chemical processes. One such process is carbon cycling.

During photosynthesis, plants use the sun's energy to produce organic matter from carbon dioxide. This organic matter provides the food at the base of the food web. Carbon dioxide is regenerated through the respiration of animals in the food web and through decomposition by the microbial community when organisms die.

Organisms that produce organic matter from inorganic matter using energy from the sun are known as "primary producers." They range in size from microscopic ocean plants to the giant redwoods of California. Decreases in primary production affect all the animal populations that depend on that production for food. Too much primary production (for example, algal blooms in water bodies) is also a problem.

Many human and natural factors impact ecological processes, including pollution and changes in land use, such as conversion of forests to urban or agricultural land. Trends in ecological processes, such as the cycling of carbon and carbon storage, provide insight into the structure and function of ecological communities and how human and natural factors affect them.

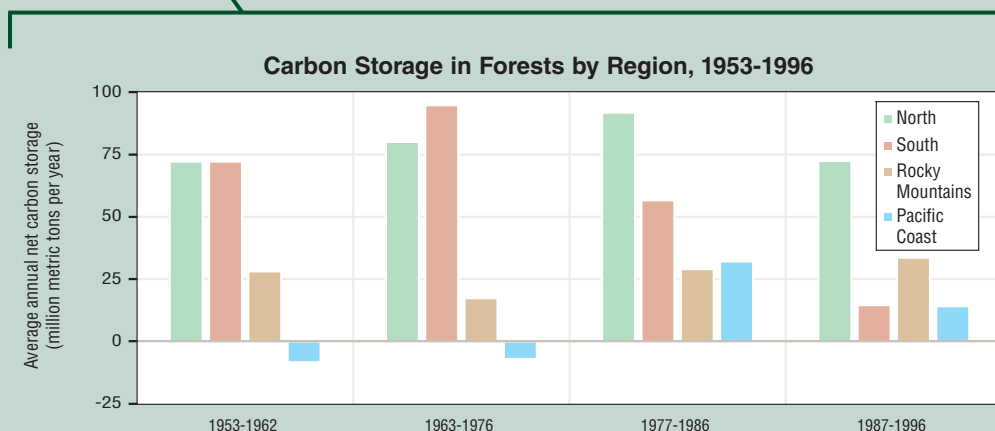
Although there are numerous components of the carbon cycle, an indicator is available for one of these components—carbon storage in forests. This indicator provides insight into a portion of the carbon cycle for forest ecosystems.



KEY POINTS

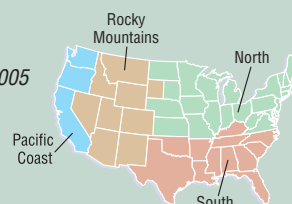
The net storage of carbon in forests increased between the 1950s and 1980s, but declined somewhat in the 1990s. Net storage is the growth of trees minus the amount of carbon removed in harvested timber. The greatest amount of carbon is being stored in the North, followed by the Rocky Mountain region. Carbon storage has decreased in the South, possibly due to an increase in harvesting compared to growth (see graphic).

A number of gaps exist in understanding trends in ecological processes. Currently, there are no reliable national indicators for the retention and processing of nutrients, primary production in aquatic systems, and reproduction and growth rates for plant and animal populations.



Data gathered in the lower 48 states.

Source: U.S. Department of Agriculture, Forest Inventory and Analysis Program, 2005



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PHYSICAL AND CHEMICAL ATTRIBUTES OF ECOLOGICAL SYSTEMS

Physical attributes of ecological systems include air temperature, light, rainfall, and sea level.

Chemical attributes include dissolved oxygen, nutrient levels, acidity, and salinity. These attributes shape evolution, drive ecological processes, and govern the nature of ecological systems. Even small changes in these attributes, such as changes in the acidity of a stream or the timing of rainfall in a desert, can have potentially large effects on ecological systems.

As species evolve, they respond to and reflect the physical and chemical attributes of the ecological systems in which they live. For example, species that evolved in

tropical waters require higher, less variable temperatures than species that evolved in temperate waters, where average temperatures are lower and fluctuate more. Similarly, periodic floods or fires are essential to sustain many species in areas where such events have occurred over thousands or millions of years.

Many factors can alter the physical and chemical characteristics of ecological systems. For example, acid rain can increase the acidity of lakes in some regions. Rivers can alter the flooding and sedimentation processes that sustain particular types of systems, such as wetlands. Changes in climate can alter species diversity and nearly every aspect of ecological structure and function.

KEY POINTS

Since 1901, temperatures in the lower 48 states rose at an average rate of 0.11°F per decade (1.1°F per century); this rate increased to 0.56°F per decade from 1979 to the present (see graphic). Global temperature has risen 0.11°F per decade since 1901 and 0.32°F per decade since 1979 (see graphic). This trend is consistent with the retreat of mountain glaciers, reduction in the extent of snow-cover, earlier spring melting of ice on rivers and lakes, and increases in sea-surface temperature.

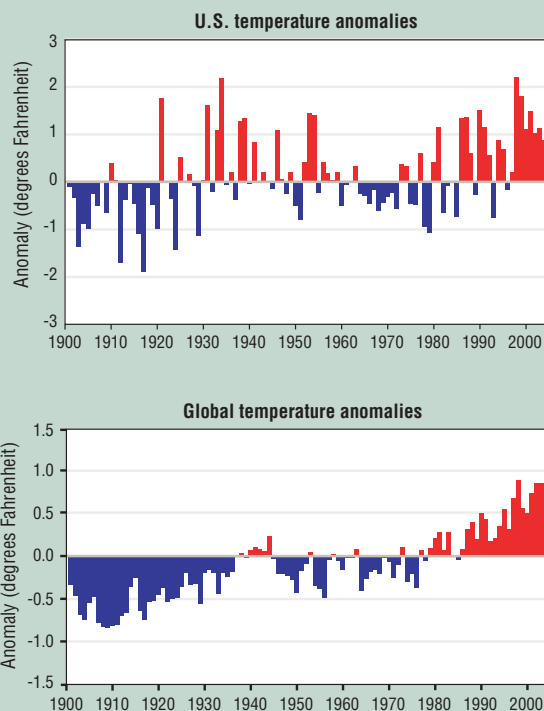
Sea levels rose steadily at many coastal locations between 1950 and 1999, particularly along the mid-Atlantic coast (3 to 6 millimeters per year) and at two sites in Louisiana (as high as 9 to 12 millimeters per year). These rates are measures of relative sea level rise, which accounts for sea and land height changes but does not distinguish between the two. These rates are based on tidal gauge monitoring. Sea level rise can alter the ecological conditions in coastal areas, especially at low land elevations. Effects can include increased flooding and loss of freshwater systems as they are transformed into inland salt waters or open coastal waters.

About 25 percent of the nation's wadeable streams show significant evidence of excess fine sediments, which can diminish habitat for aquatic life. More than half the nation's wadeable streams, however, have no substantial changes in sedimentation. Various land use practices, as well as modifications in stream flows, can lead to excess sedimentation in streams.

Many gaps remain in assessing national trends for the physical and chemical attributes of ecological systems. Recent monitoring programs have provided a

baseline for national trends in nutrients, acidity, and other factors in streams and estuaries. However, there still is a lack of trend data or historical baselines for some attributes, such as water transparency in lakes and long-term patterns of flooding and fires.

U.S. and Global Mean Temperatures, 1901-2005



U.S. data gathered in the lower 48 states.

"Anomaly" is the difference between the observed temperature and a standard that was chosen for comparison. In this case, the standard is the average temperature over the period 1961-1990.

Source: National Oceanic and Atmospheric Administration, National Climatic Data Center, 2006

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ECOLOGICAL EXPOSURE TO CONTAMINANTS

Plants and animals can be exposed to chemicals in the environment through air, water, and food. Once inside an organ-

ism, some of these chemicals concentrate in the tissues and build up over time with repeated exposure. This process is called bioaccumulation.

If concentrations of these chemicals are too great, the reproduction, health, or survival of the individual plant or animal—or organisms that consume it—can be threatened. If enough individuals in a species (or more

than one species) are affected, changes in the ecosystem structure and function can result.

Measurements of exposure include chemical concentrations in plant and animal tissues. Direct observations of organisms (such as signs of damage to plant foliage from ozone pollution) also can indicate exposure to contaminants.



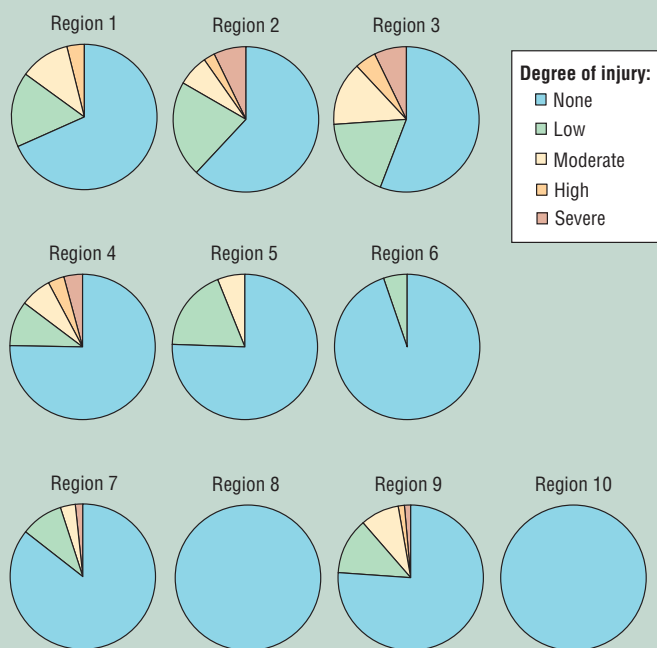
KEY POINTS

Forest plants in some areas of the country show injury from ozone pollution (see graphic). The Mid-Atlantic and Southeast show the highest levels of injury, while the West and Northwest show no damage. Ozone pollution in the lower atmosphere can significantly affect forest ecosystems. Damage to leaves is usually the first visible sign of injury to plants from ozone exposure.

Tissues from both coastal and freshwater fish contain bioaccumulative chemicals, such as the pesticide DDT or diphenyl-trichloroethane, mercury, and polychlorinated biphenyls (PCBs). While exposure to these chemicals is occurring at variable levels throughout the country, scientists have not fully assessed the ecological effects of these exposures. These chemicals are known to affect coastal and freshwater fish species, but there are currently no national threshold levels for harmful effects to fish.

No consistent national indicators are available that measure the level of chemicals in plants or in wildlife other than fish. Therefore, no national trends are available for exposure of plants and animals to many common environmental pollutants.

Ozone Injury to Forest Plants by EPA Region, 2002



Data gathered from 945 monitoring sites in 41 states. Graphic shows the percent of monitoring sites in each category.

Source: U.S. Department of Agriculture Forest Service, Forest Health Monitoring Program database, 2006



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CONCLUSION

The topics presented in this document provide important insight into what scientists know—and do not know—about current conditions and trends for the nation's air, water, land, human health, and ecological systems.

This information is based on environmental indicators and is presented at a national or regional level. Many other sources on the environment are available, including some that address issues at a more local level. EPA's Web site, www.epa.gov, is a good starting place to get more information on a particular topic or on a specific city or region of the country. Links to individual state environmental departments are available at: www.epa.gov/epahome/state.htm.

EPA is just one of many organizations working to fill the gaps in our understanding of the environment. As those gaps are filled, a more complete picture of the nation's environment will emerge.

EPA plans to report periodically on the state of the environment through publications like *EPA's 2007 Report on the Environment: Highlights of National Trends* and *EPA's 2007 Report on the Environment: Science Report*. The *electronic Report on the Environment* (www.epa.gov/xxx) will report new data as they become available and allow users to offer suggestions for making this report more useful. Your input is welcome.

ABOUT THE INDICATORS

The content of *Highlights of National Trends* is derived from *EPA's 2007 Report on the Environment: Science Report*, which features detailed information on 86 environmental indicators. A subset these indicators is presented in this document.

EPA selected indicators to highlight in this document based on their completeness, importance to the public and the scientific community, ability to show a significant trend, and ability to address a key environmental question. Indicators developed since *EPA's Draft Report on the Environment 2003* were also given priority.

ENVIRONMENTAL INDICATORS

The indicators used in the Report on the Environment:

- Rely on actual measurements of environmental and human health conditions over time.
- Meet a set of standards, which include quality, accuracy, relevance, and comparability.
- Were reviewed by an independent scientific panel to ensure that they meet these standards.
- Are national (or in some cases regional) in coverage. They do not describe trends or conditions of a specific locale.
- Come from many governmental and non-governmental organizations, which collect data at different time periods and for varying purposes.
- Can only partially answer the key questions.

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LIST OF INDICATORS

Indicators included in *EPA's 2007 Report on the Environment: Science Report* are listed below, along with the key environmental question each indicator attempts to answer. Indicators with an asterisk are featured in *Highlights of National Trends*.

AIR

OUTDOOR AIR

What are the trends in outdoor air quality and their effects on human health and the environment?

- Carbon Monoxide Emissions*
- Ambient Concentrations of Carbon Monoxide*
- Lead Emissions*
- Ambient Concentrations of Lead*
- Nitrogen Oxides Emissions*
- Ambient Concentrations of Nitrogen Dioxide*
- Volatile Organic Compounds Emissions*
- Ambient Concentrations of Ozone*
- Ozone Injury to Forest Plants
- Particulate Matter Emissions*
- Ambient Concentrations of Particulate Matter*
- Sulfur Dioxide Emissions*
- Percent of Days With Air Quality Index Values Greater Than 100
- Mercury Emissions*
- Air Toxics Emissions*
- Ambient Concentrations of Benzene*
- Ozone and Particulate Matter Concentrations for U.S. Counties in the U.S./ Mexico Border Region
- Ambient Concentrations of Manganese Compounds in EPA Region 5

ACID RAIN AND REGIONAL HAZE

What are the trends in outdoor air quality and their effects on human health and the environment?

- Nitrogen Oxides Emissions*
- Regional Haze*
- Sulfur Dioxide Emissions*
- Acid Deposition*
- Lake and Stream Acidity*
- Particulate Matter Emissions

OZONE DEPLETION

What are the trends in outdoor air quality and their effects on human health and the environment?

- Concentrations of Ozone-Depleting Substances*
- Ozone Levels Over North America*

GREENHOUSE GASES

What are the trends in greenhouse gas emissions and concentrations?

- U.S. Greenhouse Gas Emissions*
- Atmospheric Concentrations of Greenhouse Gases*

INDOOR AIR

What are the trends in indoor air quality and their effects on human health?

- U.S. Homes Above EPA's Radon Action Level*
- Blood Cotinine Level*

WATER

FRESH SURFACE WATERS

What are the trends in extent and condition of fresh surface waters and their effects on human health and the environment?

- High and Low Stream Flows*

- Streambed Stability in Wadeable Streams

- Nitrogen and Phosphorus in Wadeable Streams*

- Nitrogen and Phosphorus in Streams in Agricultural Watersheds

- Nitrogen and Phosphorus Discharge from Large Rivers*

- Pesticides in Streams in Agricultural Watersheds

- Benthic Macroinvertebrates in Wadeable Streams*

- Lake and Stream Acidity*

GROUND WATER

What are the trends in extent and condition of ground water and their effects on human health and the environment?

- Nitrates and Pesticides in Shallow Ground Water in Agricultural Watersheds*

WETLANDS

What are the trends in extent and condition of wetlands and their effects on human health and the environment?

- Wetland Extent, Change, and Sources of Change*

COASTAL WATERS

What are the trends in extent and condition of coastal waters and their effects on human health and the environment?

- Trophic State of Coastal Waters*
- Coastal Sediment Quality
- Coastal Benthic Communities*
- Submerged Aquatic Vegetation in the Chesapeake Bay*
- Hypoxia in the Gulf of Mexico and Long Island Sound*

- Harmful Algal Bloom Outbreaks Along the Western Florida Coastline

- Coastal Fish Tissue Contaminants
- Wetland Extent, Change, and Sources of Change

DRINKING WATER

What are the trends in the quality of drinking water and their effects on human health?

- Population Served by Community Water Systems With No Reported Violations of Health-Based Standards*

RECREATIONAL WATERS

What are the trends in the condition of recreational waters and their effects on human health and the environment?

There are currently no national indicators available for this topic.

CONSUMABLE FISH AND SHELLFISH

What are the trends in the condition of consumable fish and shellfish and their effects on human health?

- Coastal Fish Tissue Contaminants*
- Contaminants in Lake Fish Tissue*

LAND

LAND COVER

What are the trends in land cover and their effects on human health and the environment?

- Land Cover*
- Land Cover in the Puget Sound/ Georgia Basin
- Forest Extent and Type*

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LAND USE

What are the trends in land use and their effects on human health and the environment?

- Land Use*
- Urbanization and Population Change*

WASTES AND THE ENVIRONMENT

What are the trends in wastes and their effects on human health and the environment?

- Quantity of Municipal Solid Waste Generated and Managed*
- Quantity of RCRA Hazardous Waste Generated and Managed*

CHEMICALS APPLIED AND RELEASED TO LAND

What are the trends in chemicals used on the land and their effects on human health and the environment?

- Fertilizer Applied for Agricultural Purposes*
- Toxic Chemicals in Production-Related Wastes Released, Treated, Recycled, or Recovered for Energy Use*
- Pesticide Residues in Food*
- Reported Pesticide Incidents

CONTAMINATED LAND

What are the trends in contaminated land and their effects on human health and the environment?

- High-Priority Cleanup Sites With No Human Contact to Contamination In Excess of Health-Based Standards*
- High-Priority Cleanup Sites Where Contaminated Ground Water Is Not Continuing to Spread Above Levels of Concern*

HUMAN HEALTH

HEALTH STATUS

What are the trends in human health status in the United States?

- General Mortality*
- Life Expectancy at Birth*
- Infant Mortality*

DISEASES AND HEALTH CONDITIONS

What are the trends in human disease and conditions for which environmental pollutants may be a risk factor, including across population subgroups and geographic regions?

- Cancer Incidence*
- Cardiovascular Disease Prevalence and Mortality*
- Chronic Obstructive Pulmonary Disease Prevalence and Mortality*
- Asthma Prevalence*
- Infectious Diseases Associated With Environmental Exposures or Conditions*
- Childhood Cancer Incidence*
- Birth Defects Rates and Mortality*
- Low Birthweight*
- Preterm Delivery*

EXPOSURE TO ENVIRONMENTAL CONTAMINANTS

What are the trends in human exposure to environmental contaminants including across population subgroups and geographic regions?

- Blood Lead Level*
- Blood Mercury Level*
- Blood Cadmium Level*
- Blood Cotinine Level*
- Blood Persistent Organic Pollutants Level*
- Urinary Pesticide Level*
- Urinary Phthalate Level*

ECOLOGICAL CONDITION

PATTERNS IN ECOLOGICAL SYSTEMS

What are the trends in the extent and distribution of the nation's ecological systems?

- Forest Extent and Type*
- Forest Fragmentation*
- Ecological Connectivity in EPA Region 4*
- Relative Ecological Condition of Undeveloped Land in EPA Region 5
- Land Cover
- Land Use
- Urbanization and Population Change
- Wetland Extent, Change, and Sources of Change
- Land Cover in the Puget Sound/Georgia Basin

BIOLOGICAL DIVERSITY

What are the trends in the diversity and biological balance of the nation's ecological systems?

- Bird Populations*
- Fish Faunal Intactness*
- Non-Indigenous Species in the Estuaries of the Pacific Northwest
- Coastal Benthic Communities
- Harmful Algal Bloom Outbreaks Along the Western Florida Coastline
- Submerged Aquatic Vegetation in the Chesapeake Bay
- Benthic Macroinvertebrates in Wadeable Streams

ECOLOGICAL PROCESSES

What are the trends in the ecological processes that sustain the nation's ecological systems?

- Carbon Storage in Forests*
- Ecological Connectivity in EPA Region 4

PHYSICAL AND CHEMICAL ATTRIBUTES OF ECOLOGICAL SYSTEMS

What are the trends in the critical physical and chemical attributes and processes of the nation's ecological systems?

- U.S. and Global Mean Temperature and Precipitation*
- Sea Surface Temperature
- Sea Level*
- High and Low Stream Flows
- Lake and Stream Acidity
- Nitrogen and Phosphorus Discharge from Large Rivers
- Nitrogen and Phosphorus in Streams in Agricultural Watersheds
- Nitrogen and Phosphorus in Wadeable Streams
- Streambed Stability in Wadeable Streams*
- Hypoxia in the Gulf of Mexico and Long Island Sound

ECOLOGICAL EXPOSURE TO CONTAMINANTS

What are the trends in biomes of exposure to common environmental pollutants in plants and animals?

- Coastal Fish Tissue Contaminants*
- Contaminants in Lake Fish Tissue*
- Ozone Injury to Forest Plants*

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